Exhibit 1

Invalidity Contentions for U.S. Patent No. 7,620,327 Based on Pirelli Cable and Systems North America's WaveMux 6400 and TeraMux Dense Wavelength Division Multiplexing (DWDM) Systems ("WaveMux System")

Based upon Plaintiffs' Complaint, Infringement Contentions, and apparent claim constructions and application of the claims to Defendants' accused products, as best as they can be deciphered, Pirelli Cable and Systems North America's ("Pirelli") WaveMux Dense Wavelength Division Multiplexing ("DWDM") systems, including the 32-channel and 64-channel WaveMux 6400 DWDM system and the 128-channel TeraMux hyper-dense WDM system, as conceived, publicly demonstrated, offered for sale, sold and/or used by Pirelli and/or incorporated into networks by Pirelli and/or customers of Pirelli, including without limitation Frontier Communications ("Frontier"), Global Crossing ("GC"), Hitachi Telecom USA Inc. ("Hitachi"), Cisco Systems, Inc. ("Cisco"), FORE Systems, Inc. ("FORE"), and MCI (MCI"), ("WaveMux System") charted below anticipates or at least renders obvious the asserted claims. These invalidity contentions are not an admission by Defendants that the accused products are covered by or infringe the asserted claims, particularly when these claims are properly construed and applied. These invalidity contentions are not an admission that Defendants concede or acquiesce to any claim construction implied or suggested by Plaintiffs' Complaint or Infringement Contentions. Nor are Defendants asserting any claim construction positions through these charts, including whether the preamble is a limitation. The portions of the prior art reference cited below are not exhaustive but are exemplary in nature.

The WaveMux system was conceived, constructively reduced to practice by Pirelli engineers no later than July 25, 1994, offered for sale no later than December 1997, publicly demonstrated at conferences open to the public no later than February 1998, installed and used in Frontier's network in the U.S. no later than December 1998, and publicly demonstrated at a conference to provide 40Gbps transmission speeds no later than October 1999. Thus, the WaveMux System is available as prior art at least under 35 U.S.C. §§ 102(b), 102(g), and 103(a). At least the following documents provide evidence as to the date the WaveMux System was "offered for sale or publicly used or known," "the date the offer or use of the item took place or the information became known", and the "identity of the person or entity which made the use or which made and received the offer, or the person or entity which made the information known or to whom it was made known" [1]:

[1] Cisco does not yet have complete information regarding the dates by which this system was publicly disclosed, made, used, sold, or offered for sale, the circumstances under which the research, design, and development activities were conducted, and the identities of the particular individuals involved in such activities. Cisco anticipates that the actual dates, circumstances, and identities of individuals will be the subject of third party discovery during this lawsuit. Cisco therefore reserves the right to amend and/or supplement its Invalidity Contentions and this chart if additional information becomes available during the course of discovery. The date the WaveMux System was "offered for sale or publicly used or known," as well as "the date the offer or use of the item took place or the information became known" is at least as early as the dates identified in the published documents. The "identity of the person or entity which made the use or which made and received the offer, or the person or entity which made the information known or to whom it was made known" includes at least those persons associated with the publication(s), press releases, and conference attendees, or other documents associated with each version on the WaveMux System. Cisco

- Lightwave, “Soliton transmission has made its commercial debut, thanks to Pirelli Cables and Systems,” Pennwell Corporation, August 1, 1998
- Fiber Optics and Communications, “GlobeNet Communications Group Ltd. Announces Launch of the Atlantica Cable Network,” Information Gatekeepers Inc. 1999
- Fiber Optics Online, “Global Crossing Demonstrates Open System with IP Routers and OC-192 WDM,” Global Crossing Ltd, November 19, 1999
- Lightwave, “Industry Update,” Pennwell Corporation, June 1, 1999
- Lindstrom, Annie, “Fiber ‘Firsts’ Shine Bright: Glimpses of the Not-So-Distant Future Abound at Supercomm ’99,” Questex, LLC, July 15, 1999 (“Lindstrom Supercomm 99 Article”)
- Biagi, Susan, “Special Report; Life in the glass lane,” Penton Media, Inc., May 17, 1999 (“Biagi Supercomm 99 Article”)
- General OneFile, “Special Report; Product growth, interoperability and customer wins,” Penton Media, July 5, 1999
- General OneFile, “Pirelli to Demonstrate Network Protection Features and Flexibility of Industry-Leading TeraMux™ System During Supercomm,” PR Newswire Association LLC, June 2, 1999
- Kreifeldt, Erik, “Poised to Select OC-192 Vendor, Frontier Shifts DWDM Gears,” Fiber Optics Online, December 8, 1998
- Pirelli, “WaveMux™ 6400 Dense WDM System Overview and System Level Technical Specifications,” Pirelli Cable Corporation, December 18, 1997 (“WaveMux 1997 Specification”)
- Grasso, Giorgio, et al., “Optical-Fibre Telecommunications Line with Protection Device for Optical Amplifiers,” United States Patent No. 5,278,686, January 11, 1994 (the “’686 Patent”)
- Grasso, Giorgio, et al., “Fiber Optical Communication Line with Shut Off Control,” United States Patent No. 5,355,250, October 11, 1994
- Tamburello, Mario, et al., “Amplifier Adapter for Optical Lines,” United States Patent No. 5,267,073, November 30, 1993 (“’073 Patent”)
- Brochure Wavemux, “Wavemux ™ 3200 DWDM System”
- Pirelli, “Wavemux ™ 6400 Hyper-Dense Wavelength Division Multiplexing System Technical Specifications,” Pirelli Cable Corporation, October 15, 1998 (“WaveMux 1998 Specification”)
- “Telecom 99,” Geneva, October 10-17, 1999 (“Telecom 1999”)
- Pirelli, “Wavemux ™ 6400 DWDM System, Pirelli Cavi e Sistemi SpA, February 1999 (“WaveMux Brochure”)
- Pirelli, “TCS, 64x10Gbps System, 128x2.5Gbps System, System Technical Specification,” Pirelli Optical Systems, May 6, 1999 (“WaveMux 1999 Specification”)
- Pirelli, “TCS_FRN, Frontier Budgets, System Technical Specification,” Pirelli Optical Systems, November 22, 1999

also reserves the right to rely on the public use, offer for sale, sale, or installation of the devices described in the publications identified herein once Cisco has had a fair opportunity to take discovery on these subjects.

- Carter, Wayne, “DWDM vendors up ante at OFC: Pirelli, Ciena and Lucent to offer higher capacity,” Telephony Executive Insider Report, March 2, 1998
- EBSCOhost, “Products,” CMP Media Inc., September 17, 1998 (“EBSCO 1998”)
- Media For, “Planned super-Internet banks on wavelength-division multiplexing,” Laser Focus World, May 1998
- Technical Digest, “OFC ’98, Optical Fiber Communication Conference and Exhibit,” Optical Society of America February 22-27, 1998
- Grasso, G.A., et al., “Fully Engineered Wavelength Multiplexed 10 GBIT/S System Over a 530 KM Link of SMR Fibre with Four Optical Line Amplifiers,” Pirelli Cavi spa
- Meli, Fausto, et al., “Amplified Telecommunication System for Wavelength-Division Multiplexing Transmission Having an Equalized Reception Power,” United States Patent No. 5,852,510, December 22, 1998 (the “’510 Patent”)
- News Center, “News Center Top Story Archives, Week of January 9, 1997, Issue 1, Volume II,” Netpreneur Exchange

For example, as evidenced by at least the following documents, the WaveMux 6400 Dense WDM System Overview and System Level Technical Specification, issued December 18, 1997 by Pirelli, was distributed to customers and potential customers of the WaveMux System. Prior to February 1998, Pirelli offered for sale its 32-channel WaveMux 6400 system and publicly announced that such system was tested in a customer’s laboratory. Between February 24 and 27, 1998, at the Optical Fiber Communication Conference in San Jose, CA, Pirelli publicly displayed and demonstrated its 64-channel WaveMux 6400 DWDM system at booth 835. On February 25, 1998, Pirelli announced its 64-channel WaveMux 6400 DWDM system was available for testing and purchase by customers in a press release in the PR Newswire. In the summer of 1998, Pirelli announced its 128-channel TeraMux DWDM system was available for testing and purchase by customers. On December 8, 1998, Frontier announced that it had purchased and installed Pirelli’s 128-channel TeraMux DWDM system on a Los Angeles, CA to San Francisco, CA route in the Frontier Optronics Network and planned to install such equipment in its twenty (20) most heavily trafficked markets in this network in the US including a route between Atlanta, GA and Houston, TX.

On February 22, 1999, Pirelli announced its OSU-W module, to provide an automatic protection switching feature for IP routers and ATM switches connected to its WaveMux DWDM system after detection of a break in an optical fiber, was available for testing and purchase by customers in a press release in the PR Newswire. Between June 8 and 10, 1999, at the Supercomm ’99 conference in Atlanta, GA, Pirelli publicly displayed and demonstrated its 128-channel, 1.28 Tb/s WaveMux System at booth 7213 by transmitting and receiving OC-12 ATM data to/from FORE’s ForeRunner ASX-200BX switch, OC-48 IP data to/from Cisco’s 12000 Gigabit Switch Router (“GSR”), and OC-192 Synchronous Optical Network (“SONET”) data to/from Hitachi’s AMN 5192 terminal as DWDM optical signals within a four node unidirectional path switched ring (UPSR). Between October 10 and 17, 1999, at the ITU Worldwide Telecom Exhibition in Geneva, Switzerland, Pirelli publicly displayed and demonstrated its WaveMux System as providing 40Gbps transmission speeds and multi-protocol (IP, ATM, SDH), multi-speed (622 Mb/s, 2.5 Gb/s, 10 Gb/s, 40 Gb/s), capability in a four-node Optical Ring System. Prior to November 1999, GC deployed Pirelli’s 128-channel, 1.28 Tb/s TeraMux System to transmit and receive OC-48 and

OC-198 data as DWDM optical signals on its North American Crossing network. In November 1999, GC used the WaveMux system to transmit and receive OC-192 IP data over SONET as DWDM optical signals within GC's network between Chicago, IL and Cleveland, OH.

To the extent that the WaveMux System is found not to anticipate one or more of the asserted claims of the '327 Patent, these claims are invalid as obvious in view of the WaveMux System alone or in combination with other prior art references disclosed in Defendants' Invalidity Contentions and accompanying charts, including without limitation as set forth below.

'327 Patent	**WaveMux System**
Claim 1	
[1pre] 1. A transceiver card for a telecommunications box for transmitting data over a first optical fiber and receiving data over a second optical fiber, the card comprising:	To the extent the preamble is limiting, WaveMux System discloses this claim limitation explicitly, inherently, or as a matter of common sense, or it would have been obvious to add missing aspects of the limitation. For example, see the following passages and/or figures, as well as all related disclosures: WaveMux 1997 Specification: "The Pirelli WaveMux 6400 System is a dense wavelength division multiplexing system that can unidirectionally multiplex up to 32 wavelengths within its 1550-nm transmission window. The system can multiplex 32 channels at 2.5 Gb/s or up to eight channels at 10 Gb/s for a total transmission capacity of 80 Gb/s . . . WaveMux 6400 is fully compatible with existing linear, ring, or mesh network architectures . . . It is also fully compatible with non-dispersion shifted (i.e. Corning SMF-28) and non-zero dispersion shifted (i.e. Coming SMF/LS, Lucent TrueWave™} single-mode fiber types." P. 1-1 "The WaveMux modules are housed in subracks with optical connectors mounted on the backplane and integrated Power distribution. Redundant power is accomplished through backup power supply lines to the subrack. The mechanical design of all system modules enables smooth insertion and extraction via ejectors. The optical backplane eliminates some internal front panel optical connections simplifying cable management and factory pre-configuration. FC/SPC and SC/SPC front panel connectors are available as options." P. 1-10

’327 Patent	WaveMux System
	WaveMux 1998 Specification: “All modules, except for the multiplexers, are housed vertically in 23-inch Optical Subracks (OSR-W). Modules are either one, two, or three slots wide and fill the entire slot vertically, except for the BAT and SCF modules that are one slot wide but fit together vertically in slot 17. The Optical Subrack incorporates pre-configured slots (for the cards), electrical connectors on the top (for power supply, connection of network management platform, etc.), internal bus (for supervision, power, etc.), and backpanel connectors.” P. 5-1; Figure 5-1

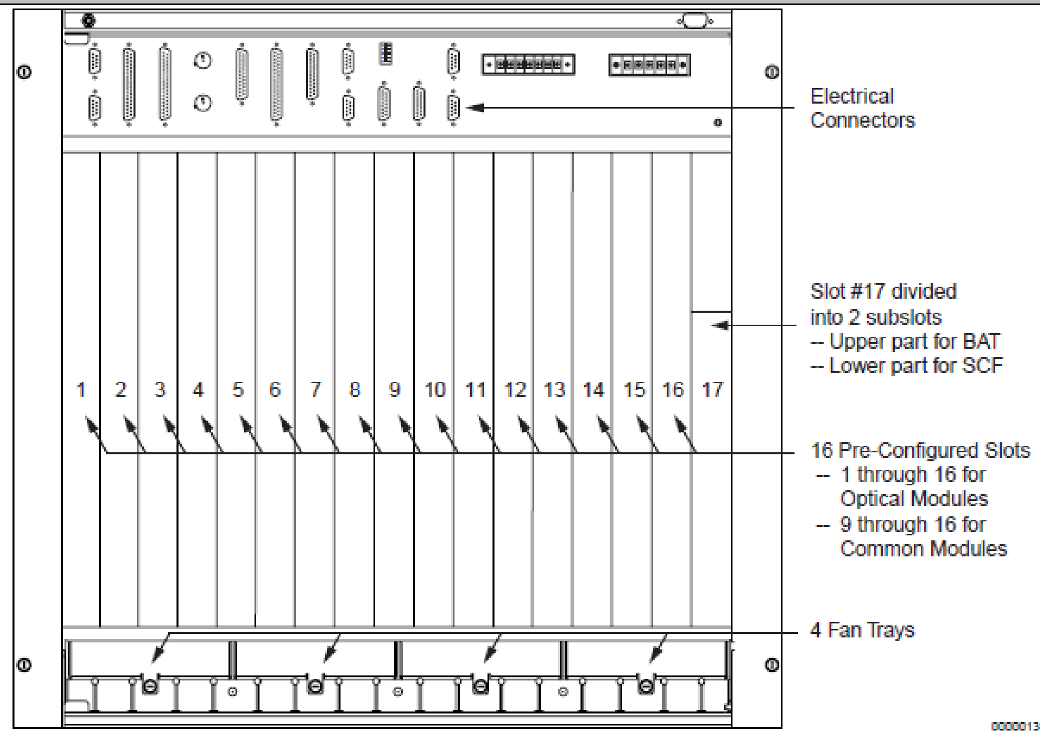
<table>
<tr><th>’327 Patent</th><th>WaveMux System</th></tr>
<tr><td></td><td>


Figure 5-1: OSR-W Subrack

WaveMux Brochure:
</td></tr>
</table>

’327 Patent	WaveMux System
	 **WaveMux™ 6400 DWDM System** One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of WaveMux System and its respective incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ P. R. 3-3 statement, particularly, § IV.B.5. Rather than repeat those disclosures here, they are incorporated by reference into this chart. Additionally, the following passages and/or figures, as well as all related disclosures, disclose this limitation:

’327 Patent	WaveMux System
	See e.g., US 5,793,909 to Leone at: “Optical connection between interconnection modules and controller 90 is similar. A plurality of optical switches function as controllers at the shelf, bay and system levels in a similar cascading scheme. For example, each shelf has an optical switch 102 for optically coupling thereto the interconnection modules within that shelf. Also, shelf controlling optical switches 102 are optically coupled to an optical switch 104 corresponding to the bay within which the shelf is located. Each bay controlling optical switch 104 is optically coupled to a system optical switch 106 for optical connection to controller 90. Depending on the optical system arrangement, controller 90 can be a frame controller providing a gateway between interconnection bus 94 and the next higher network level.” 5:66-6:12. “The present invention module 16a is preferably dimensioned so that the module fits within the allotted shelf space of an existing fiber optic distribution shelf, where fiber distribution shelves typically come in standard sizes, for example, having heights of five, seven or nine inches. In this way, the modules are easily retrofitted into the shelving of also existing fiber optic distribution frames which is a significant advantage to the present invention. As shown, push pins 166 are included on the faceplate 76 of the module in order to mechanically couple to the shelf of distribution frame.” 9:46-56. “As shown, the electronics sub-module 174 when mated with the optical sub-module 172 is disposed within an inset 190 on the faceplate 76 of the optical module. Accordingly, when the two sub-modules are mated together the combination appears as a single interconnection module.” 10:22-24. Figs. 4-7 *See e.g.* US 6,527,458 to Kim at:

’327 Patent	WaveMux System
	“A compact optical transceiver, integrated module using a silicon optical bench is provided. The module comprises a silicon optical bench having a laser diode subassembly and a photodetector subassembly integrated thereto, the laser diode subassembly including an optical signal transmitting laser diode, and the photodetector subassembly including an optical signal receiving photodetector; a PCB circuit board for installing the silicon optical bench, which is provided with a laser diode subassembly driving circuit and a photo detector subassembly driving circuit, wherein the laser diode subassembly driving circuit applies an electrical signal to the laser diode subassembly to drive the same, so that the optical signal is generated from the electric signal, and wherein the photodetector subassembly driving circuit con verts the optical signal received by the photodetector into the electric signal; and, a plastic package for sealing the PCB circuit board by wrapping a cover so that the PCB circuit board may be shielded off from the outside.” Abstract. “As the metal packaging arrangement is costly, a plastic packaging has been developed lately to reduce the production cost. In addition, as most optical transmitter and receiver modules being used today have optical fibers attached thereto thus making them inconvenient during the handling process, receptacle type optical transmitter modules without the optical fibers are gaining interest. A compact packaging arrangement, which has been pro posed in the early 1998, is about half size of the previously used optical transceiver integrated module, thus can be mounted with two times of integrity in the same area. Moreover, the compact packaging arrangement has advantages in that it can be applied to various types of connectors, such as MT-RJ connector, LC connector, etc.” 1:40-56 “It is, therefore, an object of the invention to provide a technique for manufacturing a compact optical transceiver integrated module using a silicon optical bench, in which a novel plastic packaging arrangement is provided, instead of a metal package, using a silicon optical benching technique applied to manufacture the novel optical transceiver module; as a result, the packaging size is reduced to half when compared to the previous optical transceiver module and a simple process can be performed without using the expensive metal package or other devices, and an MT-RJ or LC connector complying with international standard can be used.” 2:32-44.

’327 Patent	WaveMux System
	“According to an embodiment of the present invention, an optical transceiver module is provided by integrating the optical transmitter and receiver into one module. The plastic package reduced in the overall size to be suitable for the specification of a small package is manufactured into a novel optical transceiver module using a ferrule or 2-core ferrule fixed on the SiOB. Accordingly, the inventive package can be reduced half in size compared to the prior optical transceiver modules, thus can be mounted with the integrity of 2 times of the prior modules in the same area.” 4:12:22. “In the optical transmitter section of the inventive optical transceiver integrated module using the silicon optical fiber, the laser diode converts the electric signal into the optical signal and sends the optical signal to the outside via the optical fiber, and the light having weak intensity from the rear of the laser diode is detected by a monitor photodiode 123 arranged in the rear of the laser diode, so that the optical intensity from the front of the laser diode is adjusted by a return circuit. In the optical receiver section, the receiver photodiode converts the external optical signal transferred via the optical fiber to the electric signal.” 6:4-15. *See e.g.* “Study of surface mounting of PLC on optical fibre circuit board” by Y. Abe et al., Electronics Letters Vol. 37, No. 10, pp. 623-624: “Dense wavelength division multi/demultiplexing (DWDM) systems are being introduced into commercial systems to increase network capacity and flexibility. The successful development of DWDM will require handling a large number of optical modules and fibres to be mounted on a printed electric circuit board in a high-density manner. Fibre management for optical board integration (FMOB) [I] has been proposed as a means of achieving efficient integration and high density mounting of optical modules. The surface mounting of a planar lightwave circuit (PLC) on an optical fibre circuit board [2] will be required for realising more efficient integration and higher density mounting of optical modules. Some structures realising surface mounting have already been reported [3,4]. These approaches utilise vertical optical path conversion through the use of a reflector fabricated at the waveguide edge. To make fabrication and mounting easier and achieve a smaller loss, we propose and demonstrate the surface mounting of a PLC on an optical fibre circuit board without vertical optical path conversion.” 623.

’327 Patent	WaveMux System
	See e.g. US 6,766,070 to Williams at: “This invention relates to transmission and processing of electrical signals using an optical carrier. More particularly, it relates to a fiber optic modulator system for modulating high power optical carriers to increase the optical power from the modulator without exceeding the optical power damage threshold imposed by the modulator.” 1:6-11.
[1a] a transmitter for transmitting data over the first optical fiber, the transmitter having a laser, a modulator, and a controller receiving input data and controlling the modulator as a function of the input data, the transmitter transmitting optical signals for telecommunication as a function of the input data;	WaveMux System discloses this claim limitation explicitly, inherently, or as a matter of common sense, or it would have been obvious to add missing aspects of the limitation. For example, see the following passages and/or figures, as well as all related disclosures: WaveMux 1997 Specification: “WaveMux6400 . . . can be used with any digital transmission format, including RZ transmission standards.” P. 1-1 “Wavelength Converter Module - Externally Modulated - Normal (WCM-EM-Nxx) converts the Optical Line Terminal Equipment transmitter wavelength to a pre-selected wavelength for compatibility with Dense Wavelength Division Multiplexer equipment. WCM-EM-Nxx is a Lithium Niobate, externally modulated, distributed feedback, re-transmitter module that accepts optical inputs in the 1310 and 1550 nm transmission windows. The output wavelength of the WCM-EM-Nxx is on the 100 GHz grid referenced to 193.1THz as outlined by ITU-T Study Group 15, G.mcs Standard. WCM-EM-Nxx's are optimized for OC48/STM-16 transmission rates.” P. 1-5; *see also* WaveMux 1998 Specification at 3-1

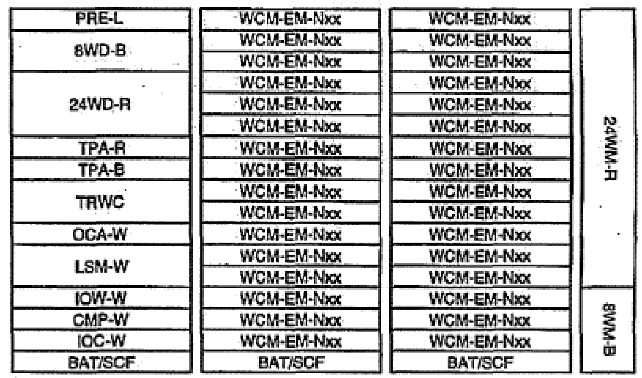


Figure 1-2: Terminal Site Configuration

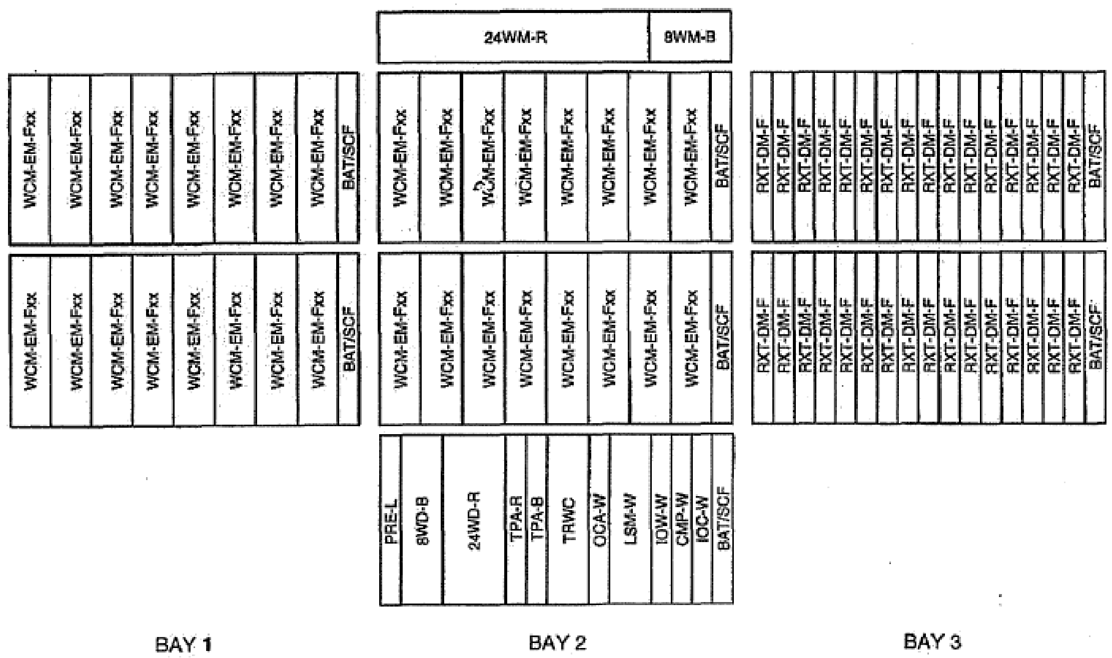


Figure 1-3: Terminal Site Configuration with Forw ard Error Correction

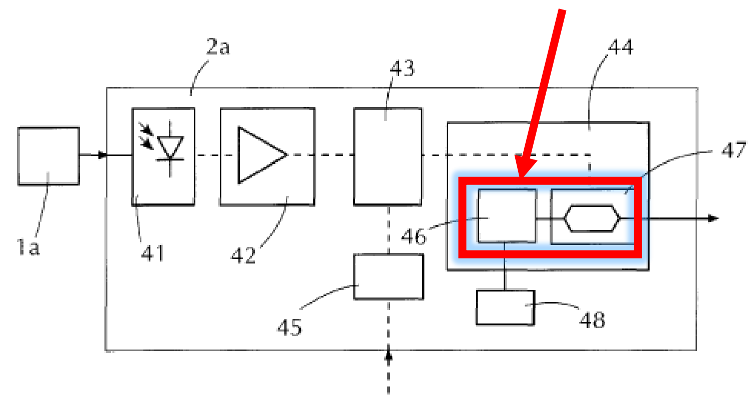
<table>
<tr><th>’327 Patent</th><th>WaveMux System</th></tr>
<tr><td></td><td>
“Wavelength Converter Module - Externally Modulated - Forward Error Correction (WCM-EM-Fxx) is a transmit transponder capable of coding the transmission signal with forward error correction framed in a 2.66 Gb/s signal. WCM-EM-Fxx increases the performance and span budgets of the system. It receives an input signal from a SONET or SDH multiplexer at a terminal.” P. 1-5; see also WaveMux 1998 Specification at 3-1

WaveMux 1998 Specification:

“Table 4-1 : Wavelength Converter Module (WCM-EM-N and WCM-EM-M) Alarms:

<table>
<tr><th rowspan="2">Item</th><th rowspan="2">Name</th><th>Alarm Type</th><th>M or C</th><th colspan="3">Working Point (Controlled Items)</th><th colspan="4">Alarm</th></tr>
<tr><th>A/D †</th><th>«</th><th>Value</th><th>Meas Unit</th><th>Type and Criteria</th><th>Thres.</th><th>Value</th><th>Meas Unit</th><th>Severity</th></tr>
<tr><td>Laser Operating Temp.</td><td>LasTemp 1</td><td>A</td><td>C</td><td>T_op</td><td>°C</td><td>FAIL</td><td>Low</td><td>T_op - 2</td><td>°C</td><td>Major</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>FAIL</td><td>High</td><td>T_op + 2</td><td>°C</td><td>Major</td></tr>
<tr><td>Laser Current</td><td>LasCurr1</td><td>A</td><td>C</td><td>I_op</td><td>mA</td><td>DEGRADE</td><td>High</td><td>I_op * 1,2</td><td>mA</td><td>minor</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>FAIL</td><td>High</td><td>I_op * 1,4</td><td>mA</td><td>Major</td></tr>
<tr><td>Laser Power</td><td>LasPwr1</td><td>A</td><td>C</td><td>P_op</td><td>mW</td><td>DEGRADE</td><td>Low</td><td>P_op * 0.8</td><td>mW</td><td>minor</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>DEGRADE</td><td>High</td><td>P_op * 1.2</td><td>mW</td><td>minor</td></tr>
</table>

‘510 Patent:
“The optical-signal transmitting station comprises generation means for generating transmission signals at least two 10 wavelengths included in a band of predetermined width . . . In particular, said generation means for generating transmission signals comprises, for each of said transmission signals, a continuous-emission laser associated with an external modulator.” 4:8-10, 4:66-5:2
</td></tr>
</table>

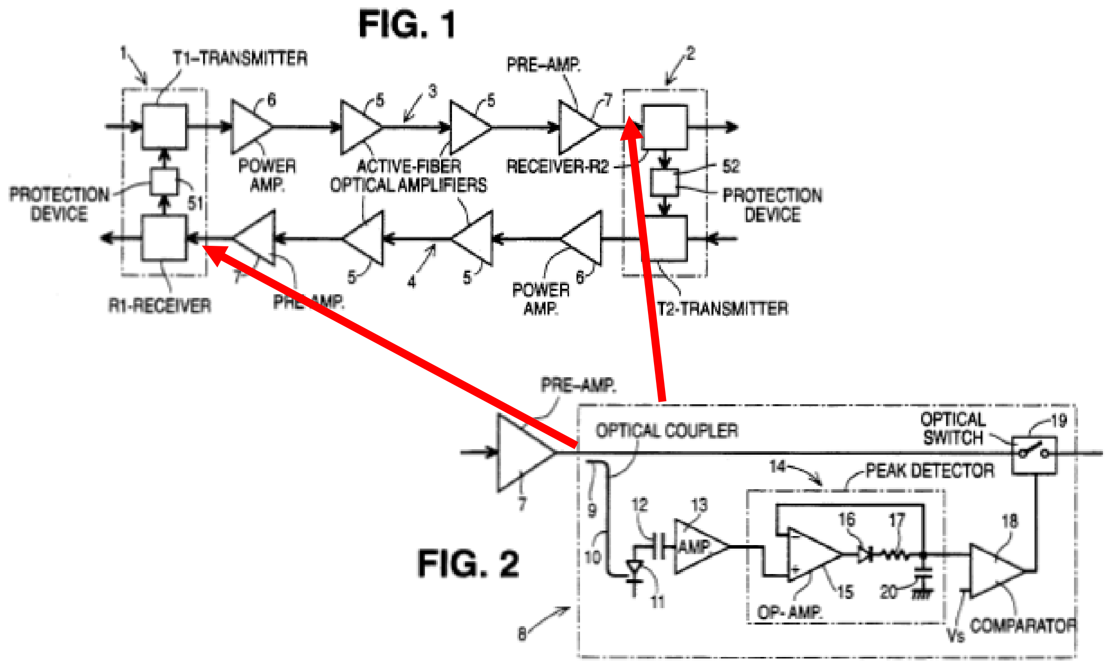
’327 Patent	WaveMux System
	“The electric output signal from the amplifier 42 is fed to a piloting circuit 43 of a modulated laser emitter, generally identified by 44, which is adapted to generate an optical signal at the selected wavelength containing the input signal information . . . The modulated laser emitter 44 comprises a laser 46 and an external modulator 47, of the Mach-Zender type for example, piloted by the output signal from circuit 43. A circuit 48 controls the emission wavelength of laser 46, keeping it constant to the previously selected value and compensating for possible external disturbances, such as temperature and the like.” 7:61-8:7; FIG. 29:  FIG. 29 “[A]n optical signal transmitting station comprising optical signal generating means for simultaneously generating at least two optical transmission signals at two different wavelengths in a band of predetermined width” cl. 1 “wherein said generating means of said transmitting station further comprises optical signal generating means controlled by said electrical signals for providing said optical transmission signals” cl. 2 “The system of claim 1, wherein said generating means comprises continuous-emission lasers coupled to modulators for generating said optical transmission signals.” cl. 8

’327 Patent	WaveMux System
	One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of WaveMux System and its respective incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ P. R. 3-3 statement, particularly, § IV.B.5. Rather than repeat those disclosures here, they are incorporated by reference into this chart. Additionally, the following passages and/or figures, as well as all related disclosures, disclose this limitation: *See e.g.* US 6,341,023 to Puc: “For embodiments of the present invention where the multiple-level formatter **130** is an M-ary pulse position modulator (PPM), the optical transmitter **140** can be a return-to-zero (RZ)/subcarrier line transmitter. For embodiments of the present invention where the multiple-level formatter **130** is an M-ary phase-shift key (PSK) modulator, the optical transmitter **140** can be based on an intensity-modulated optical source having a microwave subcarrier.” 4:24-32 “Optical transmitter **140** includes laser **141**, amplitude modulator **142** and phase modulator **143**. Laser **141** is coupled to amplitude modulator **142**, which is in turn coupled to phase modulator **143**. Multiple-level formatter **130** is coupled to optical transmitter **140** pulse shaper **134** and pre-chirp generator **135** being coupled to amplitude modulator **142** and phase modulator **143**, respectively. In other words, pulse shaper **134** is coupled to amplitude modulator **142** by line **706**; pre-chirp generator **135** is coupled phase modulator **143** by line **708**.” 5:41-50 Fig. 2 *See, e.g.*, Gao at Page. 1550 “The transmitter is one of the most extensively studied active devices for fiber-optic communication systems and networks. Direct modulation has been used for bit rates up to 2.5

’327 Patent	WaveMux System
	Gb/s. Pulses from directly modulated laser diodes are considerably chirped, which significantly reduced the transmission distance for high-speed systems. To reduce the chirp, both monolithic and hybrid integrated modulators have been used in 2.5 GHz and 10 GHz transmitters. ... Nortel Networks uses CW operated DFB laser co-packaged with a 111-V Mach-Zehnder phase modulator integrated with a variable optical attenuator (VOA)[l]. Figure 1 shows a diagram of the internal construction.” Fig. 1.
[1b] a fiber output optically connected to the laser for connecting the first optical fiber to the card;	WaveMux System discloses this claim limitation explicitly, inherently, or as a matter of common sense, or it would have been obvious to add missing aspects of the limitation. For example, see the following passages and/or figures, as well as all related disclosures: WaveMux 1997 Specification: “WaveMux 6400 is fully compatible with existing linear, ring, or mesh network architectures . . . It is also fully compatible with non-dispersion shifted (i.e. Corning SMF-28) and non-zero dispersion shifted (i.e. Coming SMF/LS, Lucent TrueWave™) single-mode fiber types.” P. 1-1; FIG. 1-1. “The WaveMux modules are housed in subracks with optical connectors mounted on the backplane.” P. 1-10; FIGS. 1-2, 1-3; WaveMux 1998 Specification: “The backpanel of the subrack houses . . . optical connectors for factory pre-configuration of the links between the modules . . . The optical backplane eliminates some internal front panel optical connections simplifying cable management and factory pre-configuration. FC/SPC and SC/SPC front panel connectors are available as options.” P. 5-1; FIG. 5-1 “5.3.5 Optical Connectors

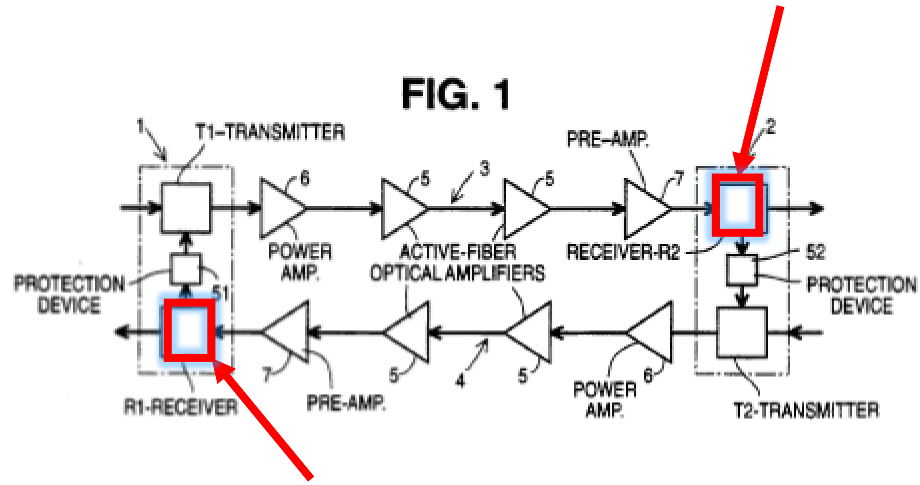
’327 Patent	WaveMux System
	Front connectors on the modules are SC/SPC (Super Polish) connectors. They are angled down and have mechanical shutters to provide protection against exposure to potentially harmful laser light. Connectors on the backplane are Diamond E-2000 type. They are fiber optic connectors with automatic closures and permit easy mating and demating.” P. 5-6 ‘510 Patent: “[T]he transmitting station includes signal generator for generating signals at several wavelengths, and connections for conveying the signals to a single optical fiber line.” Abstract “Said optical work signals are therefore fed to a signal combiner 3, adapted to simultaneously send, in a single optical output fibre 4, the work signals at their wavelengths. In general, the signal combiner 3 is a passive optical device by which the optical signals transmitted over respective optical fibres are superposed in a single fibre. Devices of this type consist for example of fused-fibre couplers, in planar optics, microoptics and the like. By way of example, an appropriate combiner is a 1x4 SMTC-OI04-1550-A-H type available from E-TEK DYNAMICS INC., 1885 Lundy Ave, San Jose, Calif. (USA).” 8:13-24; FIG. 1 “an optical fiber line connecting said transmitting and receiving stations for simultaneously transmitting both of said optical transmission signals from said transmitting station to said receiving station.” Cl. 1 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of WaveMux System and its respective incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ P. R. 3-3 statement, particularly, § IV.B.5. Rather than repeat those disclosures here, they are incorporated by reference into this chart. Additionally, the following passages and/or figures, as well as all related disclosures, disclose this limitation: *See, e.g.*, Gao at Fig. 1.

’327 Patent	WaveMux System
[1c] a fiber input for connecting the second optical fiber to the card;	WaveMux System discloses this claim limitation explicitly, inherently, or as a matter of common sense, or it would have been obvious to add missing aspects of the limitation. For example, see the following passages and/or figures, as well as all related disclosures: WaveMux 1997 Specification: “The WaveMux modules are housed in subracks with optical connectors mounted on the backplane.” P. 1-10; FIGS. 1-2, 1-3; WaveMux 1998 Specification: “The backpanel of the subrack houses . . . optical connectors for factory pre-configuration of the links between the modules . . . The optical backplane eliminates some internal front panel optical connections simplifying cable management and factory pre-configuration. FC/SPC and SC/SPC front panel connectors are available as options.” P. 5-1; FIG. 5-1 “5.3.5 Optical Connectors Front connectors on the modules are SC/SPC (Super Polish) connectors. They are angled down and have mechanical shutters to provide protection against exposure to potentially harmful laser light. Connectors on the backplane are Diamond E-2000 type. They are fiber optic connectors with automatic closures and permit easy mating and demating.” P. 5-6 ‘686 Patent: FIGS. 1, 2

’327 Patent	WaveMux System
	 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of WaveMux System and its respective incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ P. R. 3-3 statement, particularly, § IV.B.5. Rather than repeat those disclosures here, they are incorporated by reference into this chart.
[1d] a receiver optically connected to the fiber input for receiving data from the second optical fiber; and	WaveMux System discloses this claim limitation explicitly, inherently, or as a matter of common sense, or it would have been obvious to add missing aspects of the limitation. For example, see the following passages and/or figures, as well as all related disclosures:

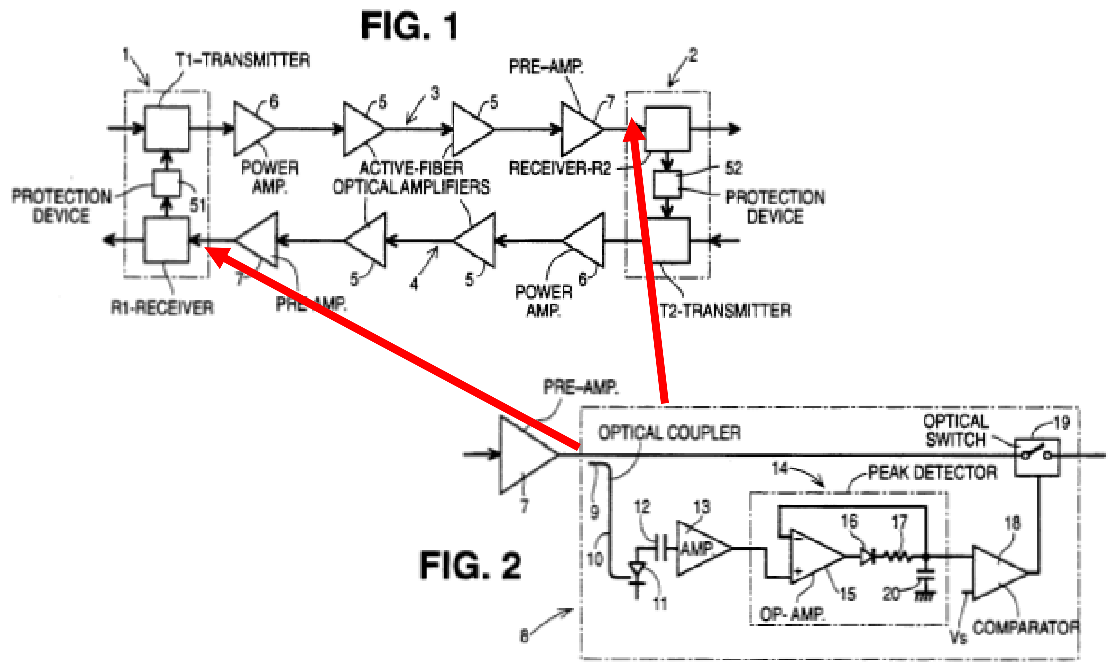
’327 Patent	WaveMux System
	WaveMux 1997 Specification: “1.2.3 Receive Transponder – Directly Modulated. Normal (RXT-DM-N) Receive Transponder - Directly Modulated - Normal (RXT-DM-N) receives SONET or SDH signal from the demultiplexing modules. RXT-DM-N also guarantees SONET or SDH interoperability. 1.2.4 Receive Transponder – Directly Modulated· FEC (RXT-DM-F) Receive Transponder-Directly Modulated - Forward Error Correction (RXT-DM-F) is capable of decoding the 2.5 Gb/s transmission signal from the 2.66 Gb/s coded frame used for forward error correction. RXT-DM-F increases the performance and span budgets of the system. Its signal is output to a SONET or SDH multiplexer at a terminal, add / drop, or regenerator site. RXT-DM-F cards are used with OC-48 or OC-192 traffic specific. *1.2.5· 24-Channel Wavelength Demultiplexer. Red Band (24WD-R)* The 24 Channel Wavelength Demultiplexer - Red Band (24WD-R) handles up to 24 channels *and* provides an isolation of greater than 25 dB between adjacent channels. The 24WD-demultiplexes wavelengths in the red band that fall between 1542 nm and 1560 nm. The output ports of the demultiplexer are easily accessible on the front panel. *1.2.6 a-Channel Wavelength Demultiplexer - Blue Band (8WD-B)* The 8-Channel Wavelength Demultiplexer - Blue Band (8WD-B) handles up to eight channels and provides an isolation of greater than 25 dB between adjacent channels. The 8WD-B demultiplexes wavelengths in the blue band that fall between 1530 nm and 1535 nm. The output ports of the demultiplexer are easily accessible on the front panel.” P. 1-5; *see also* WaveMux 1998 Specification at 3-2 (“Receive Transponder – Directly Modulated - Normal (RXT-DM-N) and B1 Byte (RXT-DM-M)”), 3-4 (“24-Channel Wavelength Demultiplexer - Red Band (24WD-R)”), 3-5 (“8-Channel Wavelength Demultiplexer - Blue Band (8WD-B)”).

’327 Patent	WaveMux System
	WaveMux 1998 Specification: “Receive Transponder modules (RXTs) can be placed between the demultiplexer unit and the SONET/SDH equipment. The RXTs are specifically designed to accept low input signal levels, reshape, retime, and regenerate the signal, and offer a fully-compliant SONET Short Reach/SDH Intra-Office interface.” P. 2-1; *see also id.* 3-2, 4-3. ‘510 Patent: “The receiving station comprises . . . separation means for separating said transmission signals from said single optical-fibre line . . . conversion means for converting said received signals to an electronic form.” 4:39, 42-43 “A multi-wavelength optical telecommunication system comprising . . . a receiving station for receiving said optical transmission signals . . . said receiving station further comprising separation means for separating said optical transmission signals received from said optical fiber line.” cl. 1 “wherein said receiving station further comprises conversion means for converting said optical transmission signals separated by said separating means into electrical signals” cl. 2 Figs. 1 & 2; ‘686 Patent: FIG. 1

’327 Patent	WaveMux System
	 “The transmitter Tl of the station 1 is connected to the receiver R2 of the station 2 through a first optical-fiber line 3 which can operate in one direction (from 1 toward 2) and the transmitter T2 of the station 2 is connected to the receiver Rl of the station 1 through a 55 second optical-fiber line 4 destined to operate in the opposite direction (from 2 toward 1).” 3:51-57 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of WaveMux System and its respective incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ P. R. 3-3 statement, particularly, § IV.B.5. Rather than repeat those disclosures here, they are incorporated by reference into this chart.
[1e] an energy level detector optically connected between the receiver and the fiber input to measure an energy level of the optical signals, wherein the energy	WaveMux System discloses this claim limitation explicitly, inherently, or as a matter of common sense, or it would have been obvious to add missing aspects of the limitation. For example, see the following passages and/or figures, as well as all related disclosures:

<table>
<tr><th>’327 Patent</th><th>WaveMux System</th></tr>
<tr><td>level detector includes a plurality of thresholds.</td><td>
WaveMux 1997 Specification:
FIG. 1-1;
WaveMux 1998 Specification:
“The operating parameters for the WaveMux optical transmission modules are:
Input Power Level
Output Power Level” p. 4-2
P. 4-3
Table 4-2 : Receive Transponders (RXT-DM-N and RXT-DM-M) Alarms
<table>
<tr><th rowspan="2">Item</th><th rowspan="2">Name</th><th rowspan="2">Alarm Type A/D †</th><th rowspan="2">M or C «</th><th colspan="4">Working Point (Controlled Items)</th><th colspan="3">Alarm</th></tr>
<tr><th>Value</th><th>Meas. Unit</th><th>Type and Criteria</th><th>Thres.</th><th>Value</th><th>Meas. Unit</th><th>Severity*</th></tr>
<tr><td>Output Power</td><td>OutPwr1</td><td>A</td><td>M</td><td>P_out</td><td>dBm</td><td>DEGRADE</td><td>Low</td><td>P_op - 1.5</td><td>dBm</td><td>minor</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>DEGRADE</td><td>High</td><td>P_op + 1.5</td><td>dBm</td><td>minor</td></tr>
<tr><td>Input Power</td><td>InpPwr1</td><td>A</td><td>M</td><td>-</td><td></td><td>FAIL</td><td>Low</td><td>Note 2</td><td>mW (dBm)</td><td>Major</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>FAIL</td><td>High</td><td>Note 2</td><td>mW (dBm)</td><td>Major</td></tr>
<tr><td>Loss of signal</td><td>los status 1</td><td>D</td><td>C</td><td>OFF</td><td></td><td></td><td></td><td>ON</td><td></td><td>Major</td></tr>
</table>
WaveMux 1999 Specification:
S 1 - Optical Channel Protection.
The Och card (OSU) will be inserted on the path of the channels to be protected, before the WCM/LEM interfaces, and after the RXT interfaces. The OSU card shall commute between
</td></tr>
</table>

’327 Patent	WaveMux System
	working and protect, based on detection of LOS caused by switching down of the RXT card when it senses an input modulation fail. EBSCO 1998 at 11 (PR Newswire, “Pirelli Introduces Optical Channel Protection On WaveMux(TM) DWDM Platform,” Feb. 22, 1999): “Pirelli Cables and Systems North America announces the introduction of an automatic protection switching feature on its advanced WaveMux(TM) DWDM platform. The OSU-W module, integral to the WaveMux(TM) system, provides protection switching for IP routers and ATM switches connected directly to the DWDM system. It causes the WaveMux(TM) system to switch data traffic to a protection channel within 50 milliseconds of a fiber break. In addition, if a customer is using a WaveMux(TM) system with some channels operating over SONET and some over IP, the OSU will protect the IP traffic while allowing the SONET layer to perform its own protection.” ‘686 Patent: “In the case of an intervention on a line fibre, say, in the presence of a breakage thereof, it is necessary to avoid the presence of light emission in the fibre, because such emission could accidentally be directed toward the **eyes** of the maintenance staff, with consequent offence for their eyes.” 1:54-59 FIGS. 1-2:

’327 Patent	WaveMux System
	 “The terminal stations 1 and 2 are provided with automatic protection devices 51, 52 of the traditional type, which in the absence of a signal at the input to the receiver on a line cause the shutting down of the transmitter operating on the opposite line. According to the present invention, as illustrated in FIG. 2 . . . there is associated a protection device 8 which comprises a coupler 9, say, of the fused-fibre type with a shunted optical waveguide 10 . . . an optical photodiode detector 11 . . . a peak detector 14, a comparator 18 with reference threshold Vs and an optical switch 19 which the comparator 18 causes to open each time the peak detector 14 detects that an optical signal at output from the pre-amplifier has an alternating component with a peak value lower than the threshold Vs. The peak detector is, for example, constituted by an

’327 Patent	WaveMux System
	backfed operational amplifier 15, whose output is connected to the comparator 18 through a diode 16, and a resistance 17 and is connected to ground by a condenser 20. The optical signal taken by the coupler 9 is converted by the photodiode 11 into a corresponding electrical signal, from which the condenser 12 withdraws the continuous component and that is subsequently amplified by the amplifier 13 . . . The withdrawal of the continuous component allows the protection device to distinguish between the transmitted optical signal, which contains a substantial alternating component, and a spontaneous emission, having a continuous component of a high level, while its alternating component has an appreciably lower level.” 4:1-54 “The signal, filtered by the condenser 12, is amplified by the amplifier 13, for example up to levels around 1 volt, and then applied across the input of the peak detector 14, whose output is a continuous signal level, which varies, for example, from about 200 m V in the presence of the spontaneous emission only to at least 600 m V in the presence of a transmitted optical signal, even if of a low level (-45 dB). This difference in level determines the triggering, in one direction or the other, of the comparator 18, whose intervention threshold can indicatively be placed around 400 mV. When it recognizes the absence of a signal, the comparator 18 opens the optical switch 19, for example, constituted by a "Switch Module 11" produced by JDS Optics.” 5:16-31 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of WaveMux System and its respective incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ P. R. 3-3 statement, particularly, § IV.B.5. Rather than repeat those disclosures here, they are incorporated by reference into this chart. Additionally, the following passages and/or figures, as well as all related disclosures, disclose this limitation: *See e.g.,* US 5,793,909 to Leone at:

’327 Patent	WaveMux System
	“The present invention is an optical monitoring and test access interconnection module especially adapted for use with a fiber optic distribution frame for a fiber optic communications system. The interconnection module provides a combination of monitoring and test access for two fiber lines, typically a transmit/receive pair, where wavelength division multiplexer (WDM) test access is provided to both the transmit and receive fibers. In one embodiment of the present invention, the interconnection module monitors only the receive fiber line where a power monitoring circuit receives a monitor level optical signal via an optical tap and converts the optical signal to an electrical output. Processing electronics and firmware within the module are operable to generate alarms and other control signals when changes in the power level of the received signal reach specified levels.” 2:3-17. “Compared to conventional arrangements, the present invention discloses and makes use of an interconnection module configuration that allows for controllers, microcontrollers and other "intelligence" or "intelligent devices" to be distributed conveniently throughout the distribution frames rather than having a plurality of passive modules in a given distribution frame routed to and from an individual testing/monitoring location. Alternatively, the interconnection module configuration of the present invention is used with an inventive interconnection fabric arrangement having intelligence distributed throughout the fabric arrangement and that facilitates use of this distributed intelligence.” 4:65-5:9. “Interconnection module 16a includes a first wavelength division multiplexer (WDM) 124 with an input optically coupled to Rx jack 62a and an output optically coupled to an optical tap 126. One output of optical tap 126 is optically coupled to Tx jack 64b and the other output is coupled to a microcontroller 128 or other suitable device for interpreting the information collected by optical tap 126. For example, microcontroller 128 may have a light detecting component such as a photodiode (not shown) that converts the light coupled from optical tap 126 to an electrical signal used internally by microcontroller 128 or by an external passive device such as an LED 134 coupled to microcontroller 128. Alternatively, microcontroller 128 may have receiving components capable of interpreting the optical information coupled from optical tap 126. As shown in FIG. 3, the microcontroller 128 is coupled to optical 126 by means of electronics 143 suitable for converting optical power to a corresponding electrical signal, as would be

’327 Patent	WaveMux System
	understood by a person skilled in the art. Also, microcontroller 128 is electrically connected to electrical interconnection fabric 72 via an electrical coupling 142.” 6:22-42. “The optical signal is optically coupled to Tx jack 64b through first WDM 124 and optical tap 126. First WDM 124 separates portions of the incoming optical signal, e.g., and transmits the desired components to optical tap 126. Optical tap deflects a small portion of the optical signal to microcontroller 128 for monitoring, testing and/or other analysis. The remaining portion of the optical signal is transmitted to Tx jack 64b for subsequent optical coupling to the Rx jack (i.e., Rx jack 64a) of a cross-connected interconnection module (i.e., interconnection module 18b). Microcontroller 128 is capable of continuously monitoring the content and/or strength of the optical signal it receives from optical tap 126 to determine if an appropriate action needs to be performed. Also, because microcontroller 128 is electrically connected via electrical interconnection fabric 72 to system controller 90, electrical information can be transmitted therebetween as needed.” 7:9-27. “Because microcontroller 128 is an actively intelligent device, it can be configured to include addressable functions. Thus, microcontroller 128 is suitable for transmitting electrical information containing address information identifying the source of the information (i.e., the interconnection module from which the information was transmitted). Also, although an optical signal strength testing operation is described above, it is within the scope of the invention for microcontroller 128 to analyze the content of tapped optical information and to communicate with system controller 90 over the established LAN accordingly. In this manner, microcontroller 128 is capable of incorporating control information, monitoring statistic information and other content-based information initiated by microcontroller into the electrical information transmitted to system controller 90 or other interconnection modules.” 7:47-62. Fig. 3 *See e.g.* US 5,825,516 to Walsh at:

’327 Patent	WaveMux System
	“The optical power meter 12 is coupled to a microcontroller system 14 via conductor 16. The optical power meter, as described further below, produces a digital pulse train whose frequency is proportional to the average optical power measured by the optical power meter 12.” 2:31-36. “The output of the counter 28 is a digital representation of the received optical energy measured by the optical power meter. The actual optical power is then determined by the microprocessor by either looking up the corresponding power level in a look-up table in memory 20 or calculating the corresponding power using a logarithmic equation, which is known to those skilled in the art.” 2:64-3:3. “Referring now to FIG. 2, a schematic diagram of the optical power meter 12 is shown. The optical power meter 12 includes an energy to current converter 42 that is juxtaposed to a fiber optic cable to receive the incoming optical energy. The optical energy is received by a photodiode 44 that converts the incoming optical energy to a current I. Converter 42 also includes an amplifier 46 that forwards the received light data onto the destination coupled to terminal 48.” 3:25-33. “It is, therefore, an object of the invention to reliably and accurately inform the user of loss factors in the fiber optic cable due to intrinsic and extrinsic factors.In order to accomplish this objective, the applicant has invented an optical power meter that includes a graphical display for displaying historical power levels of the power in the fiber optic link. The power meter can resolve very small losses in order to detect both intrinsic and extrinsic loss factors in the fiber optic link. The optical power meter, in the preferred embodiment, includes an optical energy to current converter that receives the optical energy transmitted through the fiber and converts it to a current proportional to the average power in the light transmission.” 4:11-23. “In another aspect of the invention, the system allows the user to set limits within which the power level should operate. If the measured power level falls outside of this user-defined range, the system will generate a warning signal either visually or audibly. This limit can be either above or below, or both, a baseline power level that is measured by the power meter.” 4:59-65. “The particulars of the fiber optic link are not important to the invention. Instead, the power meter according to the invention can be used with any fiber optic cable either now known or

’327 Patent	WaveMux System
	developed in the future. The fiber optic link will be referred to herein as cable 72, although it is understood that the cable may include a multiplicity of individual segments as well as having repeaters (not shown) located therein. Interposed between the source 62 and destination 64 is the optical power meter system 74 according to the invention. The system 74 includes an input jack 76 coupled to cable 72 that receives the light transmission conducted over cable 72. An additional fiber optic cable 78 is coupled between an output jack 80 of the system and an input jack 86 of computer 70. The system, as mentioned above, measures the optical power and the light transmission while at the same time passing the data through to the destination.” 5:56-6:5. “The system then compares the received optical power level determined in step 114 to the user-defined limits set in the initialization step 112. If the power level is within these user-defined limits, the microprocessor 18 transitions back to step 114 and the next sample is taken after the predetermined time period has elapsed. If, on the other hand, the received optical power falls outside one of the user-defined limits, the system sets an alarm condition in step 118 to notify the technician or user of the loss. This alarm condition can either be audible or visual. The alarm condition therefore notifies the user that the fiber optic link has been perturbed in some manner. The user can then examine the display to determine what may have been the root cause of the loss and therefore identify and isolate the problem. Thus, the system is a powerful tool to monitor and troubleshoot fiber optic networks.” 7:65-8:13. *See e.g.* JP H9-46303: “An object of the present invention is to provide a method according to which even terminal equipment not having the mechanism for monitoring frame synchronization in an electric signal can identify whether an input signal is a normal optical signal including a main signal component or an optical signal including only an amplified spontaneous emission component or identify whether or not an optical input interruption occurs, for the purpose of improving reliability of an optical transmission system.” [0005] “In view of this, the third aspect of the present invention is a method including: a photoelectric conversion step of converting the input signal of the optical receiver, which is an optical signal, into an electric signal; a peak detection step of detecting a peak value of the electric signal

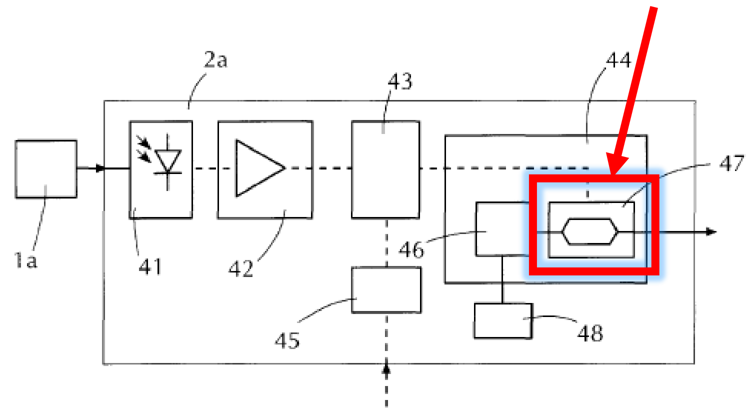
’327 Patent	WaveMux System
	converted in the photoelectric conversion step; a peak value identification step of identifying whether or not the peak value detected in the peak detection step is outside a specific range that has been set in advance; an optical input interruption determination step of determining that the input signal of the optical receiver is interrupted, if the peak value is outside the specific range; a control voltage monitoring step of monitoring a value of a control voltage inputted to a voltage control oscillator included in the phase locked loop circuit, if the peak value is within the specific range; a control voltage identification step of identifying whether the control voltage exhibits a constant value or an irregular value; a first determination step of determining that the input signal of the optical receiver is an optical signal including a main signal component, if the value of the control voltage exhibits a constant value; and a second determination step of determining that the input signal of the optical receiver is an optical signal not including a main signal component, if the value of the control voltage exhibits an irregular value.” [0013] “In view of this, the fourth aspect of the present invention is a method including: a photoelectric conversion step of converting the input signal of the optical receiver, which is an optical signal, into an electric signal; a peak detection step of detecting a peak value of the electric signal converted in the photoelectric conversion step; a peak value identification step of identifying whether or not the peak value detected in the peak detection step is outside a specific range that has been set in advance; an optical input interruption determination step of determining that the input signal of the optical receiver is interrupted, if the peak value is outside the specific range; a waveform monitoring step of monitoring a waveform of an error signal outputted from a phase detection circuit included in the phase locked loop circuit, if the peak value is within the specific range; a waveform identification step of identifying whether the waveform of the error signal is a waveform of a constant-cycle amplitude or a waveform of an irregular-cycle amplitude; a third determination step of determining that the input signal of the optical receiver is an optical signal including a main signal component, if the waveform of the error signal is a waveform of a constant-cycle amplitude; and a fourth determination step of determining that the input signal of the optical receiver is an optical signal not including a main signal component, if the waveform of the error signal is a waveform of an irregular-cycle amplitude.” [0015]

’327 Patent	WaveMux System
	“Furthermore, according to the third method, the optical receiver converts the received input signal, which is an optical signal, into an electric signal, and detects a peak value of the electric signal. Moreover, the optical receiver identifies whether or not the detected peak value is outside a specific range that has been set in advance. Here, if the peak value is outside the specific range, the optical receiver determines that input of an optical signal has been interrupted (optical input interruption). Meanwhile, if the peak value is within the specific range, the optical receiver performs identification of the input signal in a similar manner to that of the first method.” [0026-0027] “The photodiode (PD) 5 is configured to convert a received optical signal into an electric signal. Outputs of the photodiode (PD) 5 are connected to the identification circuit 9 and to the PLL circuit.” [0037] “In the comparator 101, a minimum value “VLo” of the control voltage is set. The comparator 101 compares an input voltage V with the minimum value VLo. If V > VLo, the comparator 101 outputs a signal LOW. If V < VLo, the comparator 101 outputs a signal HIGH. In the comparator 102, a maximum value “VHi” of the control voltage is set. The comparator 102 compares an input voltage V with the maximum value VHi. If V < VHi, the comparator 102 outputs a signal LOW. If V > VHi, the comparator 102 outputs a signal HIGH.” [0042-0043] “Fig. 11 illustrates a configuration of terminal equipment to which a third method of the present invention is applied. In addition to the configuration of the above-described first embodiment, an optical receiver 3 of terminal equipment 2 of the present embodiment includes a photodiode (PD) 13 and a peak detection circuit 15. The photodiode (PD) 13 is disposed in parallel to the photodiode (PD) 5. To these photodiodes (PD) 5 and 11, a received signal is inputted. An output of the photodiode (PD) 13 is connected to the peak detection circuit 15. In the peak detection circuit 15, a minimum value and a maximum value are set. The peak detection circuit 15 detects a peak value of an electric signal received from the photodiode (PD) 13, and identifies whether or not the peak value is equal to or higher than the minimum value and is equal to or lower than the maximum value. If the peak value is lower than the minimum value or higher than the maximum value, the optical receiver 3 determines that no optical signal is inputted due

’327 Patent	WaveMux System
	to a trouble of the optical transmission path 11 and/or the like. Namely, if a trouble occurs on the optical transmission path 11 and there is no optical amplifier relay station 12 between the trouble occurrence point and the terminal equipment 2, no optical signal will be inputted to the terminal equipment 2. In such a case, a value of a signal outputted from the photodiode (PD) 13 is significantly higher than a value observed when an optical signal is inputted. Thus, the optical receiver 3 can determine that input of an optical signal has been interrupted due to a trouble of the optical transmission path and/or the like, if the peak detection circuit 13 detects a peak value higher than the maximum value or a peak value lower than the minimum value.” [0060-0061] “Fig. 12 illustrates a configuration of terminal equipment to which a fourth method of the present invention is applied. In addition to the configuration of the above-described second embodiment, an optical receiver 3 of terminal equipment 2 of the present embodiment includes a photodiode (PD) 13 and a peak detection circuit 15. The photodiode (PD) 13 is disposed in parallel to the photodiode (PD) 5. To these photodiodes (PD) 5 and 11, a received signal is inputted. An output of the photodiode (PD) 13 is connected to the peak detection circuit 15. In the peak detection circuit 15, a minimum value and a maximum value are set. The peak detection circuit 15 detects a peak value of an electric signal received from the photodiode (PD) 13, and identifies whether the peak value is equal to or higher than the minimum value and is equal to or lower than the maximum value. If the peak value is lower than the minimum value or higher than the maximum value, the optical receiver 3 determines that no optical signal is inputted due to a trouble of the optical transmission path 11 and/or the like. Namely, if a trouble occurs on the optical transmission path 11 and there is no optical amplifier relay station 12 between the trouble occurrence point and the terminal equipment 2, no optical signal will be inputted to the terminal equipment 2. In such a case, a value of a signal outputted from the photodiode (PD) 13 is significantly higher (or lower) than a value observed when an optical signal is inputted. Thus, the optical receiver 3 can determine that input of an optical signal has been interrupted due to a trouble of the optical transmission path and/or the like, if the peak detection circuit 13 detects a peak value higher than the maximum value or a peak value lower than the minimum value.” [0063-0064] Figs. 11, 12

’327 Patent	WaveMux System
Claim 3	
3. The card as recited in claim 1 wherein the modulator is a phase modulator.	WaveMux System discloses this claim limitation explicitly, inherently, or as a matter of common sense, or it would have been obvious to add missing aspects of the limitation. See above re claim 1 which is incorporated by reference herein. See also: See above re claim 1a which is incorporated by reference herein. WaveMux 1997 Specification: “WaveMux6400 . . . can be used with any digital transmission format, including RZ transmission standards.” P. 1-1 “Wavelength Converter Module - Externally Modulated - Normal (WCM-EM-Nxx) converts the Optical Line Terminal Equipment transmitter wavelength to a pre-selected wavelength for compatibility with Dense Wavelength Division Multiplexer equipment. WCM-EM-Nxx is a Lithium Niobate, externally modulated, distributed feedback, re-transmitter module.” P. 1-5; *see also id.,* FIG. 1-2 (WCM-EM-Nxx); 1-3 WCM-EM-Fxx); WaveMux 1998 Specification at 3-1 WaveMux 1998 Specification: “Table 4-1 : Wavelength Converter Module (WCM-EM-N and WCM-EM-M) Alarms:

<table>
<tr><th>’327 Patent</th><th>WaveMux System</th></tr>
<tr><td></td><td>
<table>
<tr><th rowspan="2">Item</th><th rowspan="2">Name</th><th rowspan="2">Alarm Type A/D †</th><th rowspan="2">M or C «</th><th colspan="3">Working Point (Controlled Items)</th><th colspan="4">Alarm</th></tr>
<tr><th>Value</th><th>Meas Unit</th><th>Type and Criteria</th><th>Thres.</th><th>Value</th><th>Meas Unit</th><th>Severity</th></tr>
<tr><td>Output modulation Fail</td><td>modout stat 1</td><td>D</td><td>C</td><td>ON</td><td></td><td></td><td></td><td>OFF</td><td></td><td>Major</td></tr>
<tr><td>Input modulation Fail</td><td>modin stat 1</td><td>D</td><td>C</td><td>ON</td><td></td><td></td><td></td><td>OFF</td><td></td><td>Major</td></tr>
</table>
‘510 Patent:
“The optical-signal transmitting station comprises generation means for generating transmission signals at least two 10 wavelengths included in a band of predetermined width . . . In particular, said generation means for generating transmission signals comprises, for each of said transmission signals, a continuous-emission laser associated with an external modulator.” 4:8-10, 4:66-5:2
</td></tr>
</table>

’327 Patent	WaveMux System
	“The electric output signal from the amplifier 42 is fed to a piloting circuit 43 of a modulated laser emitter, generally identified by 44, which is adapted to generate an optical signal at the selected wavelength containing the input signal information . . . The modulated laser emitter 44 comprises . . . an external modulator 47, of the Mach-Zender type for example, piloted by the output signal from circuit 43.” 7:61-8:3; FIG. 29:  FIG. 29 “[A]n optical signal transmitting station comprising optical signal generating means for simultaneously generating at least two optical transmission signals at two different wavelengths in a band of predetermined width” cl. 1 “wherein said generating means of said transmitting station further comprises optical signal generating means controlled by said electrical signals for providing said optical transmission signals” cl. 2 “The system of claim 1, wherein said generating means comprises continuous-emission lasers coupled to modulators for generating said optical transmission signals.” cl. 8

’327 Patent	WaveMux System
	One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of WaveMux System and its respective incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ P. R. 3-3 statement, particularly, § IV.B.5. Additionally, the following passages and/or figures, as well as all related disclosures, disclose this limitation: *See e.g.* US 5,864,625 to Rutledge at: “Information is normally encrypted while in an electronic form by any variety of techniques well known in the art. The encrypted information is then converted into an optical form by modulating an optical beam with the encrypted information. The optical beam is then transmitted to a receiver.” 1:54-58. “However, such a system requires additional electronic circuitry at both the transmitter and receiver for combining and separating the encrypted communications information and the security key, and fails to take advantage of the ease and simplicity by which optical beams may be modulated/demodulated and the coherent nature of the light sources typically used in optical communications links (e.g., lasers).” 2:1-7. “It is yet another object of this invention to utilize the phase coherence possessed by optical telecommunications light sources in order to simplify the transmission of encrypted communications information and a security key across an optical telecommunications link.” 2:15-19. “Communications information is encrypted while in electronic form by using a security key. Both the security key and the encrypted communications information are then used to modulate an optical beam during a first and a second modulation step. Preferably, a different modulation scheme is used for each modulation step (e.g., differential phase shift keying is used for the security key modulation step and on/off keying is used for the encrypted communications

’327 Patent	WaveMux System
	information modulation step). The dual-modulated beam is then transmitted through free space, an optical fiber, or any similar medium to a receiver.” 2:27-37. “Transmitter 200 comprises a laser 202 coupled to a differential phase shift keying modulator 204 (hereinafter "DPSK modulator 204") by a first optical fiber 206, and an on/off keying modulator 208 (hereinafter "OOK modulator 208") coupled to DPSK modulator 204 via a second optical fiber 210. While modulator 204 is shown as a DPSK modulator and modulator 208 is shown as an OOK modulator, these modulator selections are merely preferred. For instance, modulator 204 may be an OOK modulator and modulator 208 may be a DPSK modulator. In general, any other modulation schemes may be used for modulators 204 and 208. Furthermore, any variety of modulation devices may be used (e.g., electro-optic amplitude or phase, acousto-optic, traveling wave, and the like).” 3:18-31. Fig 1 *See e.g.* US 6,766,070 to Williams at: “Most electro-optic modulators (EOMs) are based on proton exchanged or Ti-interdiffused waveguides in $LiNbO_3$. When an electric field is applied across a waveguide, the optical path length of the waveguide is altered, allowing the phase of the output signal to be controlled. This effect is used to both alter the phase of the light (phase modulators) and to produce amplitude modulation when the waveguide is placed within an interferometer.” 1:21-28 “The two paths form a Mach-Zender Modulator (MZM) with a $LiNbO_3$ phase modulator in one path and a fiber looped PZT in the other. The $LiNbO_3$ phase modulator imprints an RF signal onto one path of the MZM cavity, while the fiber wrapped PZT is used to control the path length difference between the two MZM paths. The two optical paths are recombined in a second PM coupler. The second PM coupler and a 1-2% coupler (also referred to as fiber tap) are used to sample a small portion of the MZM output signal which is fed back to a phase locked loop (PLL) circuit for providing feedback voltage to the fiber wrapped PZT in the second arm of the MZM in order to ensure the phase of the signals in the two arms of the MZM are matched to

’327 Patent	WaveMux System
	within a fraction of the laser linewidth. The output power of the modulator is improved by using a $LiNbO_3$ modulator within a fiber Mach-Zender cavity.” 1:65-2:14 “The phase modulator enables the phase of input signals to be modulated by an RF signal, the phase modulation is detected by the second PM coupler resulting in constructive and destructive interference. The phase modulator is preferably of the type that maintains the optical polarization of signals from the optical source which may be a diode pumped Nd:YAG ring cavity laser. The fiber modulator system further comprises a polarization maintaining erbium doped fiber amplifier disposed between the phase modulator and the second PM coupler, a second phase modulator disposed in said second path.” 2:38-52 “The method further comprises the steps of imprinting an analog RF signal onto the first path using the phase modulator; and controlling the length of the second optical path using the PZT, and disposing a second phase modulator in the second path to allow for dual drive modulation. The output of the second PM coupler is detected using a plurality of high frequency photodetectors. The outputs of the high frequency photodetectors may be subtracted to implement a balanced photodetection scheme.” 3:5-13 “The two parallel optical waveguide arms **24**, **26** form two phase modulators operating in a push-pull manner. The phase modulation is made possible due to the eletro-optic properties of the $LiNbO_3$ material used for the modulator.” 4:2-6 *See e.g.* US 6,341,023 to Puc: “The present invention recognizes that certain multiple-level modulation schemes having an appropriate preselected M value can provide for signal-to-noise ratio (SNR) improvements over binary signaling in addition to a reduction in the line rate and the line bandwidth over binary signaling. More specifically, certain modulation schemes, such as phase shifted keyed (PSK) on an optical subcarrier and pulse-position modulation (PPM), can provide a modulation gain that can offset any loss due to nonlinear distortion associated with the respective modulation scheme.

’327 Patent	WaveMux System
	This can be particularly effective when combined with forward error correction (FEC) coding that can allow for a lower signal power per channel and, consequently, can provide a more linear system.” 3:1-14 “Multiple-level formatters **130** can be any type of appropriate electrical or optical circuits or a combination of both that format the data with a multiple-level format. The multiple-level formatters **130** convert binary data to M-ary symbols corresponding to the preselected M value as discussed below in reference to FIGS. 5 and 6. One embodiment of a multiple-level formatter is discussed in reference to FIG. 2 below.” 4:11-18 “For embodiments of the present invention where the multiple-level formatter **130** is an M-ary pulse position modulator (PPM), the optical transmitter **140** can be a return-to-zero (RZ)/subcarrier line transmitter. For embodiments of the present invention where the multiple-level formatter **130** is an M-ary phase-shift key (PSK) modulator, the optical transmitter **140** can be based on an intensity-modulated optical source having a microwave subcarrier.” 4:24-32 “Optical transmitter **140** includes laser **141**, amplitude modulator **142** and phase modulator **143**. Laser **141** is coupled to amplitude modulator **142**, which is in turn coupled to phase modulator **143**. Multiple-level formatter **130** is coupled to optical transmitter **140** pulse shaper **134** and pre-chirp generator **135** being coupled to amplitude modulator **142** and phase modulator **143**, respectively. In other words, pulse shaper **134** is coupled to amplitude modulator **142** by line **706**; pre-chirp generator **135** is coupled phase modulator **143** by line **708**.” 5:41-50 “Amplitude modulator **142** modulates the amplitude of the light received from laser **141** based on the pulse train received from the pulse shaper **134**. The amplitude modulator **142** can be, for example, a Mach Zender interferometer. Phase modulator **143** modulates the phase of the signal received from amplitude modulator **142** based on the signal received from the pre-chirp generator **135**. The phase modulator **143** can be, for example, lithium niobate planar waveguide with an electro-optical modulator. The pre-chirp generator **135** applies a controlled phase modulation onto the pulses received from the pulse shaper **134** to generate a pulse having a

’327 Patent	WaveMux System
	soliton-like performance once transmitted through fiber link **200**. In other words, by modulating the phase of signals received from the amplitude modulator **142**, the phase modulator **143** reduces nonlinear distortion associated with optical signals when propagating within the fiber link **200**. The source of the nonlinear distortion includes the Kerr effect, Brillouin scattering and Raman scattering.” 6:6-23 “The transmitter system discussed in connection with FIG. 2 (based on a PPM modulation scheme) can be alternatively configured as a transmitter system based on a PSK modulation using an optical subcarrier. By including an intensity modulator between the laser and the amplitude modulator (i.e., the laser being coupled to the intensity modulator which is, in turn, coupled to the amplitude modulator), multiple-level data having a PSK format can be produced on an optical subcarrier signal.” 6:35-43 “FIG. 6 illustrates system performance of an M-ary PPM receiver using a PLL discriminator and the system performance of an M-ary PSK on optical subcarrier receiver, according to embodiments of the present invention. As shown in FIG. 6, the Q factors for various modulation schemes are plotted as a function the signal-to-noise ratio (SNR). The types of modulation schemes consider in FIG. 6 are binary AM (10 Gb/s), 2-PSK and 2-PPM (10 Gsym/s), 4-PSK and 4-PPM (5 Gsym/s), 8-PSK and 8-PPM (5 Gsym/s), and 16-PSK and 16-PPM (2.5 Gsym/s). The values plotted in FIG. 6 are based on an optical bandwidth of 60 GHz, a data bandwidth of 7.6 GHz, and an optical jitter of 5 ps.” 10:62-11:7 Figs 2, 6, 7 Claims 1, 2
Claim 4	
4. The card as recited in claim 3 wherein the receiver receives phase-modulated signals.	WaveMux System discloses this claim limitation explicitly, inherently, or as a matter of common sense, or it would have been obvious to add missing aspects of the limitation.

’327 Patent	WaveMux System
	See above re claims 1, 3 which is incorporated by reference herein. See also: See above re claim 1d which is incorporated by reference herein. One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of WaveMux System and its respective incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ P. R. 3-3 statement, particularly, § IV.B.5. Rather than repeat those disclosures here, they are incorporated by reference into this chart. Additionally, the following passages and/or figures, as well as all related disclosures, disclose this limitation: *See e.g.* US 5,864,625 to Rutledge at: “Information is normally encrypted while in an electronic form by any variety of techniques well known in the art. The encrypted information is then converted into an optical form by modulating an optical beam with the encrypted information. The optical beam is then transmitted to a receiver.” 1:54-58. “However, such a system requires additional electronic circuitry at both the transmitter and receiver for combining and separating the encrypted communications information and the security key, and fails to take advantage of the ease and simplicity by which optical beams may be modulated/demodulated and the coherent nature of the light sources typically used in optical communications links (e.g., lasers).” 2:1-7. “It is yet another object of this invention to utilize the phase coherence possessed by optical telecommunications light sources in order to simplify the transmission of encrypted communications information and a security key across an optical telecommunications link.” 2:15-19.

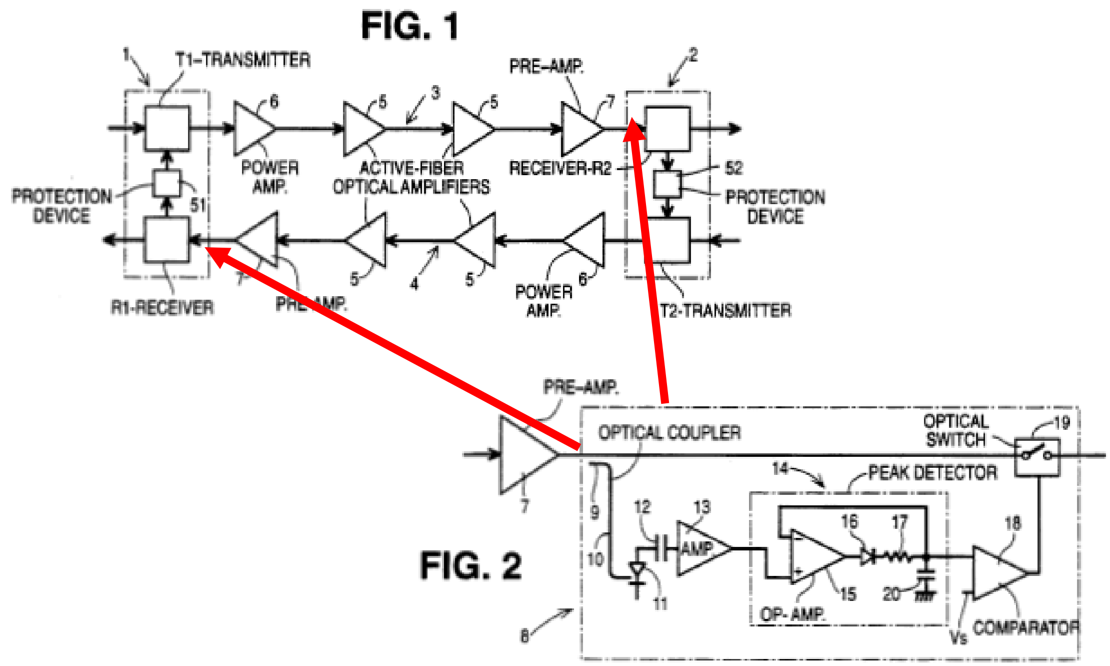
’327 Patent	WaveMux System
	“Communications information is encrypted while in electronic form by using a security key. Both the security key and the encrypted communications information are then used to modulate an optical beam during a first and a second modulation step. Preferably, a different modulation scheme is used for each modulation step (e.g., differential phase shift keying is used for the security key modulation step and on/off keying is used for the encrypted communications information modulation step). The dual-modulated beam is then transmitted through free space, an optical fiber, or any similar medium to a receiver.” 2:27-37. “Transmitter 200 comprises a laser 202 coupled to a differential phase shift keying modulator 204 (hereinafter "DPSK modulator 204") by a first optical fiber 206, and an on/off keying modulator 208 (hereinafter "OOK modulator 208") coupled to DPSK modulator 204 via a second optical fiber 210. While modulator 204 is shown as a DPSK modulator and modulator 208 is shown as an OOK modulator, these modulator selections are merely preferred. For instance, modulator 204 may be an OOK modulator and modulator 208 may be a DPSK modulator. In general, any other modulation schemes may be used for modulators 204 and 208. Furthermore, any variety of modulation devices may be used (e.g., electro-optic amplitude or phase, acousto-optic, traveling wave, and the like).” 3:18-31. “That is, light emitted from laser 202 travels along first optical fiber 206 to DPSK modulator 204 where it is modulated by the security key output by encryption and timing circuitry 100. Once modulated by DPSK modulator 204, the light then travels along second optical fiber 210 to OOK modulator 208 where it is modulated by the encrypted communications information output by encryption and timing circuitry 100. The dual-modulated light is then transmitted across transmission medium 50 to receiver 300.” 3:41-49. Fig. 1 *See e.g.* US 6,766,070 to Williams at:

’327 Patent	WaveMux System
	“Most electro-optic modulators (EOMs) are based on proton exchanged or Ti-interdiffused waveguides in $LiNbO_3$. When an electric field is applied across a waveguide, the optical path length of the waveguide is altered, allowing the phase of the output signal to be controlled. This effect is used to both alter the phase of the light (phase modulators) and to produce amplitude modulation when the waveguide is placed within an interferometer.” 1:21-28 “The two paths form a Mach-Zender Modulator (MZM) with a $LiNbO_3$ phase modulator in one path and a fiber looped PZT in the other. The $LiNbO_3$ phase modulator imprints an RF signal onto one path of the MZM cavity, while the fiber wrapped PZT is used to control the path length difference between the two MZM paths. The two optical paths are recombined in a second PM coupler. The second PM coupler and a 1-2% coupler (also referred to as fiber tap) are used to sample a small portion of the MZM output signal which is fed back to a phase locked loop (PLL) circuit for providing feedback voltage to the fiber wrapped PZT in the second arm of the MZM in order to ensure the phase of the signals in the two arms of the MZM are matched to within a fraction of the laser linewidth. The output power of the modulator is improved by using a $LiNbO_3$ modulator within a fiber Mach-Zender cavity.” 1:65-2:14 “The method further comprises the steps of imprinting an analog RF signal onto the first path using the phase modulator; and controlling the length of the second optical path using the PZT, and disposing a second phase modulator in the second path to allow for dual drive modulation. The output of the second PM coupler is detected using a plurality of high frequency photodetectors. The outputs of the high frequency photodetectors may be subtracted to implement a balanced photodetection scheme.” 3:5-13 “The two parallel optical waveguide arms **24**, **26** form two phase modulators operating in a push-pull manner. The phase modulation is made possible due to the eletro-optic properties of the $LiNbO_3$ material used for the modulator.” 4:2-6 *See e.g.* US 6,341,023 to Puc:

’327 Patent	WaveMux System
	“The present invention recognizes that certain multiple-level modulation schemes having an appropriate preselected M value can provide for signal-to-noise ratio (SNR) improvements over binary signaling in addition to a reduction in the line rate and the line bandwidth over binary signaling. More specifically, certain modulation schemes, such as phase shifted keyed (PSK) on an optical subcarrier and pulse-position modulation (PPM), can provide a modulation gain that can offset any loss due to nonlinear distortion associated with the respective modulation scheme. This can be particularly effective when combined with forward error correction (FEC) coding that can allow for a lower signal power per channel and, consequently, can provide a more linear system.” 3:1-14 “Multiple-level formatters **130** can be any type of appropriate electrical or optical circuits or a combination of both that format the data with a multiple-level format. The multiple-level formatters **130** convert binary data to M-ary symbols corresponding to the preselected M value as discussed below in reference to FIGS. 5 and 6. One embodiment of a multiple-level formatter is discussed in reference to FIG. 2 below.” 4:11-18 “For embodiments of the present invention where the multiple-level formatter **130** is an M-ary pulse position modulator (PPM), the optical transmitter **140** can be a return-to-zero (RZ)/subcarrier line transmitter. For embodiments of the present invention where the multiple-level formatter **130** is an M-ary phase-shift key (PSK) modulator, the optical transmitter **140** can be based on an intensity-modulated optical source having a microwave subcarrier.” 4:24-32 “Optical transmitter **140** includes laser **141**, amplitude modulator **142** and phase modulator **143**. Laser **141** is coupled to amplitude modulator **142**, which is in turn coupled to phase modulator **143**. Multiple-level formatter **130** is coupled to optical transmitter **140** pulse shaper **134** and pre-chirp generator **135** being coupled to amplitude modulator **142** and phase modulator **143**, respectively. In other words, pulse shaper **134** is coupled to amplitude modulator **142** by line **706**; pre-chirp generator **135** is coupled phase modulator **143** by line **708**.” 5:41-50

’327 Patent	WaveMux System
	“Amplitude modulator **142** modulates the amplitude of the light received from laser **141** based on the pulse train received from the pulse shaper **134**. The amplitude modulator **142** can be, for example, a Mach Zender interferometer. Phase modulator **143** modulates the phase of the signal received from amplitude modulator **142** based on the signal received from the pre-chirp generator **135**. The phase modulator **143** can be, for example, lithium niobate planar waveguide with an electro-optical modulator. The pre-chirp generator **135** applies a controlled phase modulation onto the pulses received from the pulse shaper **134** to generate a pulse having a soliton-like performance once transmitted through fiber link **200**. In other words, by modulating the phase of signals received from the amplitude modulator **142**, the phase modulator **143** reduces nonlinear distortion associated with optical signals when propagating within the fiber link **200**. The source of the nonlinear distortion includes the Kerr effect, Brillouin scattering and Raman scattering.” 6:6-23 “The transmitter system discussed in connection with FIG. 2 (based on a PPM modulation scheme) can be alternatively configured as a transmitter system based on a PSK modulation using an optical subcarrier. By including an intensity modulator between the laser and the amplitude modulator (i.e., the laser being coupled to the intensity modulator which is, in turn, coupled to the amplitude modulator), multiple-level data having a PSK format can be produced on an optical subcarrier signal.” 6:35-43 “FIG. 6 illustrates system performance of an M-ary PPM receiver using a PLL discriminator and the system performance of an M-ary PSK on optical subcarrier receiver, according to embodiments of the present invention. As shown in FIG. 6, the Q factors for various modulation schemes are plotted as a function the signal-to-noise ratio (SNR). The types of modulation schemes consider in FIG. 6 are binary AM (10 Gb/s), 2-PSK and 2-PPM (10 Gsym/s), 4-PSK and 4-PPM (5 Gsym/s), 8-PSK and 8-PPM (5 Gsym/s), and 16-PSK and 16-PPM (2.5 Gsym/s). The values plotted in FIG. 6 are based on an optical bandwidth of 60 GHz, a data bandwidth of 7.6 GHz, and an optical jitter of 5 ps.” 10:62-11:7

’327 Patent	WaveMux System
	Figs 2, 6, 7 Claims 1, 2
Claim 5	
5. The card as recited in claim 1 wherein the energy level detector includes a photodiode and a liner or logarithmic amplifier scaling an output of the photodiode.	WaveMux System discloses this claim limitation explicitly, inherently, or as a matter of common sense, or it would have been obvious to add missing aspects of the limitation. See above re claim 1 which is incorporated by reference herein. See also: See above re claim 1f which is incorporated by reference herein. ‘686 Patent: FIGS. 1-2:

’327 Patent	WaveMux System
	 “According to the present invention, as illustrated in FIG. 2 . . . there is associated a protection device 8 which comprises . . . an optical photodiode detector 11 . . . a peak detector 14, a comparator 18 with reference threshold Vs and an optical switch 19 which the comparator 18 causes to open each time the peak detector 14 detects that an optical signal at output from the pre-amplifier has an alternating component with a peak value lower than the threshold Vs. The peak detector is, for example, constituted by an backfed operational amplifier 15, whose output is connected to the comparator 18 through a diode 16, and a resistance 17 and is connected to ground by a condenser 20. The optical signal taken by the coupler 9 is converted by the photodiode 11 into a corresponding electrical signal, from which the condenser 12 withdraws the continuous component and that is subsequently amplified by the amplifier 13 . . . The withdrawal of the continuous component allows the protection device to distinguish between the

’327 Patent	WaveMux System
	transmitted optical signal, which contains a substantial alternating component, and a spontaneous emission, having a continuous component of a high level, while its alternating component has an appreciably lower level.” 4:1-54 “The signal, filtered by the condenser 12, is amplified by the amplifier 13, for example up to levels around 1 volt, and then applied across the input of the peak detector 14, whose output is a continuous signal level, which varies, for example, from about 200 m V in the presence of the spontaneous emission only to at least 600 m V in the presence of a transmitted optical signal, even if of a low level (-45 dB). This difference in level determines the triggering, in one direction or the other, of the comparator 18, whose intervention threshold can indicatively be placed around 400 mV. When it recognizes the absence of a signal, the comparator 18 opens the optical switch 19, for example, constituted by a "Switch Module 11" produced by JDS Optics.” 5:16-31 One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of WaveMux System and its respective incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ P. R. 3-3 statement, particularly, § IV.B.5. Rather than repeat those disclosures here, they are incorporated by reference into this chart. Additionally, the following passages and/or figures, as well as all related disclosures, disclose this limitation: *See e.g.,* US 5,793,909 to Leone at: “Interconnection module 16a includes a first wavelength division multiplexer (WDM) 124 with an input optically coupled to Rx jack 62a and an output optically coupled to an optical tap 126. One output of optical tap 126 is optically coupled to Tx jack 64b and the other output is coupled to a microcontroller 128 or other suitable device for interpreting the information collected by optical tap 126. For example, microcontroller 128 may have a light detecting component such as a photodiode (not shown) that converts the light coupled from optical tap 126 to an electrical signal used internally by microcontroller 128 or by an external passive device such as an LED

’327 Patent	WaveMux System
	134 coupled to microcontroller 128. Alternatively, microcontroller 128 may have receiving components capable of interpreting the optical information coupled from optical tap 126. As shown in FIG. 3, the microcontroller 128 is coupled to optical 126 by means of electronics 143 suitable for converting optical power to a corresponding electrical signal, as would be understood by a person skilled in the art. Also, microcontroller 128 is electrically connected to electrical interconnection fabric 72 via an electrical coupling 142.” 6:22-42. *See e.g.* US 5,825,516 to Walsh at: “The output of the counter 28 is a digital representation of the received optical energy measured by the optical power meter. The actual optical power is then determined by the microprocessor by either looking up the corresponding power level in a look-up table in memory 20 or calculating the corresponding power using a logarithmic equation, which is known to those skilled in the art.” 2:64-3:3. “Referring now to FIG. 2, a schematic diagram of the optical power meter 12 is shown. The optical power meter 12 includes an energy to current converter 42 that is juxtaposed to a fiber optic cable to receive the incoming optical energy. The optical energy is received by a photodiode 44 that converts the incoming optical energy to a current I. Converter 42 also includes an amplifier 46 that forwards the received light data onto the destination coupled to terminal 48.” 3:25-33. “The optical power meter, in the preferred embodiment, includes an optical energy to current converter that receives the optical energy transmitted through the fiber and converts it to a current proportional to the average power in the light transmission. This converter also amplifies the received light and forwards it onto its destination so as to not interrupt the transmission. This allows the optical power meter to be placed continuously in the system so as to record historical power level data. Power meter also includes a current-to-voltage converter, which in the preferred embodiment, is a transimpedance amplifier. The transimpedance amplifier converts the current to a negative voltage proportional to the amplitude of the current. The output of the transimpedance amplifier is coupled to a voltage-to-frequency converter that converts the

'327 Patent	WaveMux System
	voltage output of the transimpedance amplifier to a pulse train having a frequency proportional to the amplitude of the voltage signal. This pulse train increments a counter that is read in periodic intervals by a microprocessor. The microprocessor reads the digital output of the counter and resets the counter to begin counting the number of pulses in the next time period. This digital value provided by the counter then is a digital representation of the optical power level. The microprocessor can either then look up the power level corresponding to this digital representation in a look-up table or calculate the average power level on the fly using a logarithmic equation." 4:19-46. "Referring now to FIG. 5, a schematic diagram of a first embodiment of the optical power meter 85 is shown. The optical power meter 88 according to the invention includes an energy to current converter 90 that is juxtaposed to the cable 72 to receive the incoming optical energy. The optical energy is received by a photodiode 92 that converts the incoming optical energy to a current I. The photodiode 92, in the preferred embodiment, is an indium gallium arsenide photodiode having a wavelength of 1310 nanometers (nm). Converter 90 also includes an amplifier 94 that forwards the received light data onto the destination. The current I produced by the photodiode 92 is passed through a high frequency filter comprised of multi-layered ferrites 96 and 98. The output of the high frequency filter is a DC current. The output of the filter is provided to a current-to-voltage converter 100. At the core of current-to-voltage converter is a transimpedance amplifier 102. The amplifier 102 has a noninverting input connected to ground and an inverting input connected to the output of the high frequency filter. By grounding the noninverting input, a zero bias voltage is provided to the anode of the photodiode 92. The transimpedance amplifier 102 includes a parallel capacitor C1 and resistor RI combination in the feedback loop to create a low frequency pole (e.g., 159 Hz). The lowpass filter in the feedback path is optional, however, because of the bandwidth of the transimpedance amplifier, which cannot respond to the high frequency components in any case. The transimpedance amplifier produces a negative voltage that is proportional to the amplitude of the photo current I." 6:39-67.
Claim 6	

<table>
<tr><th>’327 Patent</th><th>WaveMux System</th></tr>
<tr><td>6. The card as recited in claim 1 wherein the thresholds are programmable.</td><td>WaveMux System discloses this claim limitation explicitly, inherently, or as a matter of common sense, or it would have been obvious to add missing aspects of the limitation.

See above re claim 1 which is incorporated by reference herein.

See also:

See above re claim 1f which is incorporated by reference herein.

WaveMux 1998 Specification:

4.1 Supervisory Unit CMP-W

Each WaveMux system site has at least one Control and Monitoring Processor Module (CMP-W), the heart of the management system. It controls all the modules at the site (optical modules as well as common modules), collects module information on one internal control bus (status, alarms, parameters, actions), and passes this information to:

• a serial RS232 port to which the Local Craft Terminal can be connected.
• an Ethernet bus to which:
– Pirelli IEMS Software can be connected (via Q3 interface), or
– Pirelli WaveLook Software can be connected using a PC with an Ethernet interface.

CMP-W Module Parameters:
CPU — Intel Pentium 133 MHz
Memory/Interruptions/DMA Controller — Intel 82430HX (Triton II) PC/AT
Memory — DRAM 16-32-64 or 128 MByte
Cache — SRAM 256 kByte
Internal Control BUS — PCI-based Ethernet HDLC on RS485
Internal Ethernet BUS — IEEE 802.3 (TCP/IP Protocol) 10/100 Base 2</td></tr>
</table>

’327 Patent	WaveMux System
	“The operating parameters for the WaveMux optical transmission modules are: Input Power Level Output Power Level” p. 4-2 P. 4-3

Table 4-2 : **Receive Transponders (RXT-DM-N and RXT-DM-M) Alarms**

Item	Name	Alarm Type A/D †	M or C «	Working Point (Controlled Items)				Alarm		
				Value	Meas. Unit	Type and Criteria	Thres.	Value	Meas. Unit	Severity*
Output Power	OutPwr1	A	M	P_out	dBm	DEGRADE	Low	P_op - 1.5	dBm	minor
						DEGRADE	High	P_op + 1.5	dBm	minor
Input Power	InpPwr1	A	M	-		FAIL	Low	**Note 2**	mW (dBm)	Major
						FAIL	High	**Note 2**	mW (dBm)	Major
Loss of signal	los status 1	D	C	OFF				ON		Major

One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of WaveMux System and its respective incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ P. R. 3-3 statement, particularly, § IV.B.5. Rather than repeat those disclosures here, they are incorporated by reference into this chart. Additionally, the following passages and/or figures, as well as all related disclosures, disclose this limitation:

See e.g., US 5,793,909 to Leone at:

“The present invention is an optical monitoring and test access interconnection module especially adapted for use with a fiber optic distribution frame for a fiber optic communications

’327 Patent	WaveMux System
	system. The interconnection module provides a combination of monitoring and test access for two fiber lines, typically a transmit/receive pair, where wavelength division multiplexer (WDM) test access is provided to both the transmit and receive fibers. In one embodiment of the present invention, the interconnection module monitors only the receive fiber line where a power monitoring circuit receives a monitor level optical signal via an optical tap and converts the optical signal to an electrical output. Processing electronics and firmware within the module are operable to generate alarms and other control signals when changes in the power level of the received signal reach specified levels.” 2:3-17. “Interconnection module 16a includes a first wavelength division multiplexer (WDM) 124 with an input optically coupled to Rx jack 62a and an output optically coupled to an optical tap 126. One output of optical tap 126 is optically coupled to Tx jack 64b and the other output is coupled to a microcontroller 128 or other suitable device for interpreting the information collected by optical tap 126. For example, microcontroller 128 may have a light detecting component such as a photodiode (not shown) that converts the light coupled from optical tap 126 to an electrical signal used internally by microcontroller 128 or by an external passive device such as an LED 134 coupled to microcontroller 128. Alternatively, microcontroller 128 may have receiving components capable of interpreting the optical information coupled from optical tap 126. As shown in FIG. 3, the microcontroller 128 is coupled to optical 126 by means of electronics 143 suitable for converting optical power to a corresponding electrical signal, as would be understood by a person skilled in the art. Also, microcontroller 128 is electrically connected to electrical interconnection fabric 72 via an electrical coupling 142.” 6:22-42. “Because microcontroller 128 is an actively intelligent device, it can be configured to include addressable functions. Thus, microcontroller 128 is suitable for transmitting electrical information containing address information identifying the source of the information (i.e., the interconnection module from which the information was transmitted). Also, although an optical signal strength testing operation is described above, it is within the scope of the invention for microcontroller 128 to analyze the content of tapped optical information and to communicate with system controller 90 over the established LAN accordingly. In this manner, microcontroller 128 is capable of incorporating control information, monitoring statistic information and other

’327 Patent	WaveMux System
	content-based information initiated by microcontroller into the electrical information transmitted to system controller 90 or other interconnection modules.” 7:47-62. *See e.g.* US 5,825,516 to Walsh at: “The optical power meter 12 is coupled to a microcontroller system 14 via conductor 16. The optical power meter, as described further below, produces a digital pulse train whose frequency is proportional to the average optical power measured by the optical power meter 12.” 2:31-36. “In another aspect of the invention, the system allows the user to set limits within which the power level should operate. If the measured power level falls outside of this user-defined range, the system will generate a warning signal either visually or audibly. This limit can be either above or below, or both, a baseline power level that is measured by the power meter.” 4:59-65. “The system then compares the received optical power level determined in step 114 to the user-defined limits set in the initialization step 112. If the power level is within these user-defined limits, the microprocessor 18 transitions back to step 114 and the next sample is taken after the predetermined time period has elapsed. If, on the other hand, the received optical power falls outside one of the user-defined limits, the system sets an alarm condition in step 118 to notify the technician or user of the loss. This alarm condition can either be audible or visual. The alarm condition therefore notifies the user that the fiber optic link has been perturbed in some manner. The user can then examine the display to determine what may have been the root cause of the loss and therefore identify and isolate the problem. Thus, the system is a powerful tool to monitor and troubleshoot fiber optic networks.” 7:65-8:13. *See e.g.* JP H9-46303: “In the comparator 101, a minimum value “VLo” of the control voltage is set. The comparator 101 compares an input voltage V with the minimum value VLo. If V > VLo, the comparator 101 outputs a signal LOW. If V < VLo, the comparator 101 outputs a signal HIGH. In the

’327 Patent	WaveMux System
	comparator 102, a maximum value “VHi” of the control voltage is set. The comparator 102 compares an input voltage V with the maximum value VHi. If V < VHi, the comparator 102 outputs a signal LOW. If V > VHi, the comparator 102 outputs a signal HIGH.” [0042-0043] “Fig. 11 illustrates a configuration of terminal equipment to which a third method of the present invention is applied. In addition to the configuration of the above-described first embodiment, an optical receiver 3 of terminal equipment 2 of the present embodiment includes a photodiode (PD) 13 and a peak detection circuit 15. The photodiode (PD) 13 is disposed in parallel to the photodiode (PD) 5. To these photodiodes (PD) 5 and 11, a received signal is inputted. An output of the photodiode (PD) 13 is connected to the peak detection circuit 15. In the peak detection circuit 15, a minimum value and a maximum value are set. The peak detection circuit 15 detects a peak value of an electric signal received from the photodiode (PD) 13, and identifies whether or not the peak value is equal to or higher than the minimum value and is equal to or lower than the maximum value. If the peak value is lower than the minimum value or higher than the maximum value, the optical receiver 3 determines that no optical signal is inputted due to a trouble of the optical transmission path 11 and/or the like. Namely, if a trouble occurs on the optical transmission path 11 and there is no optical amplifier relay station 12 between the trouble occurrence point and the terminal equipment 2, no optical signal will be inputted to the terminal equipment 2. In such a case, a value of a signal outputted from the photodiode (PD) 13 is significantly higher than a value observed when an optical signal is inputted. Thus, the optical receiver 3 can determine that input of an optical signal has been interrupted due to a trouble of the optical transmission path and/or the like, if the peak detection circuit 13 detects a peak value higher than the maximum value or a peak value lower than the minimum value.” [0060-0061] “Fig. 12 illustrates a configuration of terminal equipment to which a fourth method of the present invention is applied. In addition to the configuration of the above-described second embodiment, an optical receiver 3 of terminal equipment 2 of the present embodiment includes a photodiode (PD) 13 and a peak detection circuit 15. The photodiode (PD) 13 is disposed in parallel to the photodiode (PD) 5. To these photodiodes (PD) 5 and 11, a received signal is inputted. An output of the photodiode (PD) 13 is connected to the peak detection circuit 15. In the peak detection circuit 15, a minimum value and a maximum value are set. The peak

’327 Patent	WaveMux System
	detection circuit 15 detects a peak value of an electric signal received from the photodiode (PD) 13, and identifies whether the peak value is equal to or higher than the minimum value and is equal to or lower than the maximum value. If the peak value is lower than the minimum value or higher than the maximum value, the optical receiver 3 determines that no optical signal is inputted due to a trouble of the optical transmission path 11 and/or the like. Namely, if a trouble occurs on the optical transmission path 11 and there is no optical amplifier relay station 12 between the trouble occurrence point and the terminal equipment 2, no optical signal will be inputted to the terminal equipment 2. In such a case, a value of a signal outputted from the photodiode (PD) 13 is significantly higher (or lower) than a value observed when an optical signal is inputted. Thus, the optical receiver 3 can determine that input of an optical signal has been interrupted due to a trouble of the optical transmission path and/or the like, if the peak detection circuit 13 detects a peak value higher than the maximum value or a peak value lower than the minimum value.” [0063-0064]
Claim 7	
7. The card as recited in claim 1 wherein the energy level detector includes a detector controller capable of setting values for the thresholds.	WaveMux System discloses this claim limitation explicitly, inherently, or as a matter of common sense, or it would have been obvious to add missing aspects of the limitation. See above re claim 1 which is incorporated by reference herein. See also: See above re claim 1f, 6 which are incorporated by reference herein. One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of WaveMux System and its respective incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ P. R. 3-3 statement, particularly, § IV.B.5. Rather than repeat those disclosures here, they are incorporated by reference into this chart. Additionally, the following passages and/or figures, as well as all related disclosures, disclose this limitation:

’327 Patent	WaveMux System
	See e.g. JP H9-46303: “In the comparator 101, a minimum value “VLo” of the control voltage is set. The comparator 101 compares an input voltage V with the minimum value VLo. If V > VLo, the comparator 101 outputs a signal LOW. If V < VLo, the comparator 101 outputs a signal HIGH. In the comparator 102, a maximum value “VHi” of the control voltage is set. The comparator 102 compares an input voltage V with the maximum value VHi. If V < VHi, the comparator 102 outputs a signal LOW. If V > VHi, the comparator 102 outputs a signal HIGH.” [0042-0043] “Fig. 11 illustrates a configuration of terminal equipment to which a third method of the present invention is applied. In addition to the configuration of the above-described first embodiment, an optical receiver 3 of terminal equipment 2 of the present embodiment includes a photodiode (PD) 13 and a peak detection circuit 15. The photodiode (PD) 13 is disposed in parallel to the photodiode (PD) 5. To these photodiodes (PD) 5 and 11, a received signal is inputted. An output of the photodiode (PD) 13 is connected to the peak detection circuit 15. In the peak detection circuit 15, a minimum value and a maximum value are set. The peak detection circuit 15 detects a peak value of an electric signal received from the photodiode (PD) 13, and identifies whether or not the peak value is equal to or higher than the minimum value and is equal to or lower than the maximum value. If the peak value is lower than the minimum value or higher than the maximum value, the optical receiver 3 determines that no optical signal is inputted due to a trouble of the optical transmission path 11 and/or the like. Namely, if a trouble occurs on the optical transmission path 11 and there is no optical amplifier relay station 12 between the trouble occurrence point and the terminal equipment 2, no optical signal will be inputted to the terminal equipment 2. In such a case, a value of a signal outputted from the photodiode (PD) 13 is significantly higher than a value observed when an optical signal is inputted. Thus, the optical receiver 3 can determine that input of an optical signal has been interrupted due to a trouble of the optical transmission path and/or the like, if the peak detection circuit 13 detects a peak value higher than the maximum value or a peak value lower than the minimum value.” [0060-0061] “Fig. 12 illustrates a configuration of terminal equipment to which a fourth method of the present invention is applied. In addition to the configuration of the above-described second

’327 Patent	WaveMux System
	embodiment, an optical receiver 3 of terminal equipment 2 of the present embodiment includes a photodiode (PD) 13 and a peak detection circuit 15. The photodiode (PD) 13 is disposed in parallel to the photodiode (PD) 5. To these photodiodes (PD) 5 and 11, a received signal is inputted. An output of the photodiode (PD) 13 is connected to the peak detection circuit 15. In the peak detection circuit 15, a minimum value and a maximum value are set. The peak detection circuit 15 detects a peak value of an electric signal received from the photodiode (PD) 13, and identifies whether the peak value is equal to or higher than the minimum value and is equal to or lower than the maximum value. If the peak value is lower than the minimum value or higher than the maximum value, the optical receiver 3 determines that no optical signal is inputted due to a trouble of the optical transmission path 11 and/or the like. Namely, if a trouble occurs on the optical transmission path 11 and there is no optical amplifier relay station 12 between the trouble occurrence point and the terminal equipment 2, no optical signal will be inputted to the terminal equipment 2. In such a case, a value of a signal outputted from the photodiode (PD) 13 is significantly higher (or lower) than a value observed when an optical signal is inputted. Thus, the optical receiver 3 can determine that input of an optical signal has been interrupted due to a trouble of the optical transmission path and/or the like, if the peak detection circuit 13 detects a peak value higher than the maximum value or a peak value lower than the minimum value.” [0063-0064]
Claim 8	
8. The card as recited in claim 7 wherein the detector controller receives an indication of a threshold being crossed.	WaveMux System discloses this claim limitation explicitly, inherently, or as a matter of common sense, or it would have been obvious to add missing aspects of the limitation. See above re claim 1 which is incorporated by reference herein. See also: See above re claim 1f, 6 which are incorporated by reference herein. WaveMux 1998 Specification: “The operating parameters for the WaveMux optical transmission modules are:

’327 Patent	WaveMux System
	Input Power Level Output Power Level” p. 4-2 P. 4-3 ‘687 Patent: “According to the present invention, as illustrated in FIG. 2 . . . there is associated a protection device 8 which comprises . . . a peak detector 14, a comparator 18 with reference threshold Vs and an optical switch 19 which the comparator 18 causes to open each time the peak detector 14 detects that an optical signal at output from the pre-amplifier has an alternating component with a peak value lower than the threshold Vs.” 4:6-21 “The signal, filtered by the condenser 12, is amplified by the amplifier 13, for example up to levels around 1 volt, and then applied across the input of the peak detector 14, whose output is a continuous signal level, which varies, for example, from about 200 m V in the presence of the spontaneous emission only to at least 600 m V in the presence of a transmitted optical signal, even if of a low level (-45 dB). This difference in level determines the triggering, in one direction or the other, of the comparator 18, whose intervention threshold can indicatively be placed around 400 mV. When it recognizes the absence of a signal, the comparator 18 opens the optical switch 19, for example, constituted by a "Switch Module 11" produced by JDS Optics.” 5:16-31

<table>
<tr><th>’327 Patent</th><th>WaveMux System</th></tr>
<tr><td></td><td>

Table 4-2 : **Receive Transponders (RXT-DM-N and RXT-DM-M) Alarms**

<table>
<tr><th rowspan="2">Item</th><th rowspan="2">Name</th><th rowspan="2">Alarm Type A/D †</th><th rowspan="2">M or C «</th><th colspan="4">Working Point (Controlled Items)</th><th colspan="3">Alarm</th></tr>
<tr><th>Value</th><th>Meas. Unit</th><th>Type and Criteria</th><th>Thres.</th><th>Value</th><th>Meas. Unit</th><th>Severity*</th></tr>
<tr><td>Output Power</td><td>OutPwr1</td><td>A</td><td>M</td><td>P_out</td><td>dBm</td><td>DEGRADE</td><td>Low</td><td>P_op - 1.5</td><td>dBm</td><td>minor</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>DEGRADE</td><td>High</td><td>P_op + 1.5</td><td>dBm</td><td>minor</td></tr>
<tr><td>Input Power</td><td>InpPwr1</td><td>A</td><td>M</td><td>-</td><td></td><td>FAIL</td><td>Low</td><td>Note 2</td><td>mW (dBm)</td><td>Major</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>FAIL</td><td>High</td><td>Note 2</td><td>mW (dBm)</td><td>Major</td></tr>
<tr><td>Loss of signal</td><td>los status 1</td><td>D</td><td>C</td><td>OFF</td><td></td><td></td><td></td><td>ON</td><td></td><td>Major</td></tr>
</table>

One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of WaveMux System and its respective incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ P. R. 3-3 statement, particularly, § IV.B.5. Rather than repeat those disclosures here, they are incorporated by reference into this chart. Additionally, the following passages and/or figures, as well as all related disclosures, disclose this limitation:

See e.g. JP H9-46303:

“In the comparator 101, a minimum value “VLo” of the control voltage is set. The comparator 101 compares an input voltage V with the minimum value VLo. If V > VLo, the comparator 101 outputs a signal LOW. If V < VLo, the comparator 101 outputs a signal HIGH. In the comparator 102, a maximum value “VHi” of the control voltage is set. The comparator 102 compares an input voltage V with the maximum value VHi. If V < VHi, the comparator 102 outputs a signal LOW. If V > VHi, the comparator 102 outputs a signal HIGH.” [0042-0043]

</td></tr>
</table>

’327 Patent	WaveMux System
	“Fig. 11 illustrates a configuration of terminal equipment to which a third method of the present invention is applied. In addition to the configuration of the above-described first embodiment, an optical receiver 3 of terminal equipment 2 of the present embodiment includes a photodiode (PD) 13 and a peak detection circuit 15. The photodiode (PD) 13 is disposed in parallel to the photodiode (PD) 5. To these photodiodes (PD) 5 and 11, a received signal is inputted. An output of the photodiode (PD) 13 is connected to the peak detection circuit 15. In the peak detection circuit 15, a minimum value and a maximum value are set. The peak detection circuit 15 detects a peak value of an electric signal received from the photodiode (PD) 13, and identifies whether or not the peak value is equal to or higher than the minimum value and is equal to or lower than the maximum value. If the peak value is lower than the minimum value or higher than the maximum value, the optical receiver 3 determines that no optical signal is inputted due to a trouble of the optical transmission path 11 and/or the like. Namely, if a trouble occurs on the optical transmission path 11 and there is no optical amplifier relay station 12 between the trouble occurrence point and the terminal equipment 2, no optical signal will be inputted to the terminal equipment 2. In such a case, a value of a signal outputted from the photodiode (PD) 13 is significantly higher than a value observed when an optical signal is inputted. Thus, the optical receiver 3 can determine that input of an optical signal has been interrupted due to a trouble of the optical transmission path and/or the like, if the peak detection circuit 13 detects a peak value higher than the maximum value or a peak value lower than the minimum value.” [0060-0061] “Fig. 12 illustrates a configuration of terminal equipment to which a fourth method of the present invention is applied. In addition to the configuration of the above-described second embodiment, an optical receiver 3 of terminal equipment 2 of the present embodiment includes a photodiode (PD) 13 and a peak detection circuit 15. The photodiode (PD) 13 is disposed in parallel to the photodiode (PD) 5. To these photodiodes (PD) 5 and 11, a received signal is inputted. An output of the photodiode (PD) 13 is connected to the peak detection circuit 15. In the peak detection circuit 15, a minimum value and a maximum value are set. The peak detection circuit 15 detects a peak value of an electric signal received from the photodiode (PD) 13, and identifies whether the peak value is equal to or higher than the minimum value and is equal to or lower than the maximum value. If the peak value is lower than the minimum value or higher than the maximum value, the optical receiver 3 determines that no optical signal is

’327 Patent	WaveMux System
	inputted due to a trouble of the optical transmission path 11 and/or the like. Namely, if a trouble occurs on the optical transmission path 11 and there is no optical amplifier relay station 12 between the trouble occurrence point and the terminal equipment 2, no optical signal will be inputted to the terminal equipment 2. In such a case, a value of a signal outputted from the photodiode (PD) 13 is significantly higher (or lower) than a value observed when an optical signal is inputted. Thus, the optical receiver 3 can determine that input of an optical signal has been interrupted due to a trouble of the optical transmission path and/or the like, if the peak detection circuit 13 detects a peak value higher than the maximum value or a peak value lower than the minimum value.” [0063-0064]
Claim 9	
9. The card as recited in claim 1 wherein the plurality of thresholds bound an acceptable energy range for the received light.	WaveMux System discloses this claim limitation explicitly, inherently, or as a matter of common sense, or it would have been obvious to add missing aspects of the limitation. See above re claim 1 which is incorporated by reference herein. See also: See above re claim 1f, 6 which are incorporated by reference herein. WaveMux 1998 Specification: “The operating parameters for the WaveMux optical transmission modules are: Input Power Level Output Power Level” p. 4-2 P. 4-3

’327 Patent	WaveMux System

Table 4-2 : Receive Transponders (RXT-DM-N and RXT-DM-M) Alarms

Item	Name	Alarm Type A/D †	M or C «	Working Point (Controlled Items) Value	Meas. Unit	Type and Criteria	Thres.	Alarm Value	Meas. Unit	Severity*
Output Power	OutPwr1	A	M	P_out	dBm	DEGRADE	Low	P_op - 1.5	dBm	minor
						DEGRADE	High	P_op + 1.5	dBm	minor
Input Power	InpPwr1	A	M	-		FAIL	Low	**Note 2**	mW (dBm)	Major
						FAIL	High	**Note 2**	mW (dBm)	Major
Loss of signal	los status 1	D	C	OFF				ON		Major

One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of WaveMux System and its respective incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ P. R. 3-3 statement, particularly, § IV.B.5. Rather than repeat those disclosures here, they are incorporated by reference into this chart. Additionally, the following passages and/or figures, as well as all related disclosures, disclose this limitation:

See e.g. JP H9-46303:

“In the comparator 101, a minimum value “VLo” of the control voltage is set. The comparator 101 compares an input voltage V with the minimum value VLo. If V > VLo, the comparator 101 outputs a signal LOW. If V < VLo, the comparator 101 outputs a signal HIGH. In the comparator 102, a maximum value “VHi” of the control voltage is set. The comparator 102 compares an input voltage V with the maximum value VHi. If V < VHi, the comparator 102 outputs a signal LOW. If V > VHi, the comparator 102 outputs a signal HIGH.” [0042-0043]

“Fig. 11 illustrates a configuration of terminal equipment to which a third method of the present invention is applied. In addition to the configuration of the above-described first embodiment,

’327 Patent	WaveMux System
	an optical receiver 3 of terminal equipment 2 of the present embodiment includes a photodiode (PD) 13 and a peak detection circuit 15. The photodiode (PD) 13 is disposed in parallel to the photodiode (PD) 5. To these photodiodes (PD) 5 and 11, a received signal is inputted. An output of the photodiode (PD) 13 is connected to the peak detection circuit 15. In the peak detection circuit 15, a minimum value and a maximum value are set. The peak detection circuit 15 detects a peak value of an electric signal received from the photodiode (PD) 13, and identifies whether or not the peak value is equal to or higher than the minimum value and is equal to or lower than the maximum value. If the peak value is lower than the minimum value or higher than the maximum value, the optical receiver 3 determines that no optical signal is inputted due to a trouble of the optical transmission path 11 and/or the like. Namely, if a trouble occurs on the optical transmission path 11 and there is no optical amplifier relay station 12 between the trouble occurrence point and the terminal equipment 2, no optical signal will be inputted to the terminal equipment 2. In such a case, a value of a signal outputted from the photodiode (PD) 13 is significantly higher than a value observed when an optical signal is inputted. Thus, the optical receiver 3 can determine that input of an optical signal has been interrupted due to a trouble of the optical transmission path and/or the like, if the peak detection circuit 13 detects a peak value higher than the maximum value or a peak value lower than the minimum value.” [0060-0061] “Fig. 12 illustrates a configuration of terminal equipment to which a fourth method of the present invention is applied. In addition to the configuration of the above-described second embodiment, an optical receiver 3 of terminal equipment 2 of the present embodiment includes a photodiode (PD) 13 and a peak detection circuit 15. The photodiode (PD) 13 is disposed in parallel to the photodiode (PD) 5. To these photodiodes (PD) 5 and 11, a received signal is inputted. An output of the photodiode (PD) 13 is connected to the peak detection circuit 15. In the peak detection circuit 15, a minimum value and a maximum value are set. The peak detection circuit 15 detects a peak value of an electric signal received from the photodiode (PD) 13, and identifies whether the peak value is equal to or higher than the minimum value and is equal to or lower than the maximum value. If the peak value is lower than the minimum value or higher than the maximum value, the optical receiver 3 determines that no optical signal is inputted due to a trouble of the optical transmission path 11 and/or the like. Namely, if a trouble occurs on the optical transmission path 11 and there is no optical amplifier relay station 12

’327 Patent	WaveMux System
	between the trouble occurrence point and the terminal equipment 2, no optical signal will be inputted to the terminal equipment 2. In such a case, a value of a signal outputted from the photodiode (PD) 13 is significantly higher (or lower) than a value observed when an optical signal is inputted. Thus, the optical receiver 3 can determine that input of an optical signal has been interrupted due to a trouble of the optical transmission path and/or the like, if the peak detection circuit 13 detects a peak value higher than the maximum value or a peak value lower than the minimum value.” [0063-0064]
Claim 10	
10. The card as recited in claim 1 wherein the plurality of thresholds indicate a drop in amplitude of a phase-modulated signal.	WaveMux System discloses this claim limitation explicitly, inherently, or as a matter of common sense, or it would have been obvious to add missing aspects of the limitation. See above re claim 1 which is incorporated by reference herein. See also: See above re claims 1f, 6, 9 which are incorporated by reference herein. One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of WaveMux System and its respective incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ P. R. 3-3 statement, particularly, § IV.B.5. Rather than repeat those disclosures here, they are incorporated by reference into this chart. Additionally, the following passages and/or figures, as well as all related disclosures, disclose this limitation: *See e.g.* JP H9-46303: “In the comparator 101, a minimum value “VLo” of the control voltage is set. The comparator 101 compares an input voltage V with the minimum value VLo. If V > VLo, the comparator 101 outputs a signal LOW. If V < VLo, the comparator 101 outputs a signal HIGH. In the comparator 102, a maximum value “VHi” of the control voltage is set. The comparator 102

’327 Patent	WaveMux System
	compares an input voltage V with the maximum value VHi. If V < VHi, the comparator 102 outputs a signal LOW. If V > VHi, the comparator 102 outputs a signal HIGH.” [0042-0043] “Fig. 11 illustrates a configuration of terminal equipment to which a third method of the present invention is applied. In addition to the configuration of the above-described first embodiment, an optical receiver 3 of terminal equipment 2 of the present embodiment includes a photodiode (PD) 13 and a peak detection circuit 15. The photodiode (PD) 13 is disposed in parallel to the photodiode (PD) 5. To these photodiodes (PD) 5 and 11, a received signal is inputted. An output of the photodiode (PD) 13 is connected to the peak detection circuit 15. In the peak detection circuit 15, a minimum value and a maximum value are set. The peak detection circuit 15 detects a peak value of an electric signal received from the photodiode (PD) 13, and identifies whether or not the peak value is equal to or higher than the minimum value and is equal to or lower than the maximum value. If the peak value is lower than the minimum value or higher than the maximum value, the optical receiver 3 determines that no optical signal is inputted due to a trouble of the optical transmission path 11 and/or the like. Namely, if a trouble occurs on the optical transmission path 11 and there is no optical amplifier relay station 12 between the trouble occurrence point and the terminal equipment 2, no optical signal will be inputted to the terminal equipment 2. In such a case, a value of a signal outputted from the photodiode (PD) 13 is significantly higher than a value observed when an optical signal is inputted. Thus, the optical receiver 3 can determine that input of an optical signal has been interrupted due to a trouble of the optical transmission path and/or the like, if the peak detection circuit 13 detects a peak value higher than the maximum value or a peak value lower than the minimum value.” [0060-0061] “Fig. 12 illustrates a configuration of terminal equipment to which a fourth method of the present invention is applied. In addition to the configuration of the above-described second embodiment, an optical receiver 3 of terminal equipment 2 of the present embodiment includes a photodiode (PD) 13 and a peak detection circuit 15. The photodiode (PD) 13 is disposed in parallel to the photodiode (PD) 5. To these photodiodes (PD) 5 and 11, a received signal is inputted. An output of the photodiode (PD) 13 is connected to the peak detection circuit 15. In the peak detection circuit 15, a minimum value and a maximum value are set. The peak detection circuit 15 detects a peak value of an electric signal received from the photodiode (PD)

’327 Patent	WaveMux System
	13, and identifies whether the peak value is equal to or higher than the minimum value and is equal to or lower than the maximum value. If the peak value is lower than the minimum value or higher than the maximum value, the optical receiver 3 determines that no optical signal is inputted due to a trouble of the optical transmission path 11 and/or the like. Namely, if a trouble occurs on the optical transmission path 11 and there is no optical amplifier relay station 12 between the trouble occurrence point and the terminal equipment 2, no optical signal will be inputted to the terminal equipment 2. In such a case, a value of a signal outputted from the photodiode (PD) 13 is significantly higher (or lower) than a value observed when an optical signal is inputted. Thus, the optical receiver 3 can determine that input of an optical signal has been interrupted due to a trouble of the optical transmission path and/or the like, if the peak detection circuit 13 detects a peak value higher than the maximum value or a peak value lower than the minimum value.” [0063-0064] *See e.g.* US 6,341,023 to Puc: “The present invention recognizes that certain multiple-level modulation schemes having an appropriate preselected M value can provide for signal-to-noise ratio (SNR) improvements over binary signaling in addition to a reduction in the line rate and the line bandwidth over binary signaling. More specifically, certain modulation schemes, such as phase shifted keyed (PSK) on an optical subcarrier and pulse-position modulation (PPM), can provide a modulation gain that can offset any loss due to nonlinear distortion associated with the respective modulation scheme. This can be particularly effective when combined with forward error correction (FEC) coding that can allow for a lower signal power per channel and, consequently, can provide a more linear system.” 3:1-14 “Multiple-level formatters **130** can be any type of appropriate electrical or optical circuits or a combination of both that format the data with a multiple-level format. The multiple-level formatters **130** convert binary data to M-ary symbols corresponding to the preselected M value as discussed below in reference to FIGS. 5 and 6. One embodiment of a multiple-level formatter is discussed in reference to FIG. 2 below.” 4:11-18

’327 Patent	WaveMux System
	“For embodiments of the present invention where the multiple-level formatter **130** is an M-ary pulse position modulator (PPM), the optical transmitter **140** can be a return-to-zero (RZ)/subcarrier line transmitter. For embodiments of the present invention where the multiple-level formatter **130** is an M-ary phase-shift key (PSK) modulator, the optical transmitter **140** can be based on an intensity-modulated optical source having a microwave subcarrier.” 4:24-32 “Optical transmitter **140** includes laser **141**, amplitude modulator **142** and phase modulator **143**. Laser **141** is coupled to amplitude modulator **142**, which is in turn coupled to phase modulator **143**. Multiple-level formatter **130** is coupled to optical transmitter **140** pulse shaper **134** and pre-chirp generator **135** being coupled to amplitude modulator **142** and phase modulator **143**, respectively. In other words, pulse shaper **134** is coupled to amplitude modulator **142** by line **706**; pre-chirp generator **135** is coupled phase modulator **143** by line **708**.” 5:41-50 “Amplitude modulator **142** modulates the amplitude of the light received from laser **141** based on the pulse train received from the pulse shaper **134**. The amplitude modulator **142** can be, for example, a Mach Zender interferometer. Phase modulator **143** modulates the phase of the signal received from amplitude modulator **142** based on the signal received from the pre-chirp generator **135**. The phase modulator **143** can be, for example, lithium niobate planar waveguide with an electro-optical modulator. The pre-chirp generator **135** applies a controlled phase modulation onto the pulses received from the pulse shaper **134** to generate a pulse having a soliton-like performance once transmitted through fiber link **200**. In other words, by modulating the phase of signals received from the amplitude modulator **142**, the phase modulator **143** reduces nonlinear distortion associated with optical signals when propagating within the fiber link **200**. The source of the nonlinear distortion includes the Kerr effect, Brillouin scattering and Raman scattering.” 6:6-23 “The transmitter system discussed in connection with FIG. 2 (based on a PPM modulation scheme) can be alternatively configured as a transmitter system based on a PSK modulation using an optical subcarrier. By including an intensity modulator between the laser and the

’327 Patent	WaveMux System
	amplitude modulator (i.e., the laser being coupled to the intensity modulator which is, in turn, coupled to the amplitude modulator), multiple-level data having a PSK format can be produced on an optical subcarrier signal.” 6:35-43 “FIG. 6 illustrates system performance of an M-ary PPM receiver using a PLL discriminator and the system performance of an M-ary PSK on optical subcarrier receiver, according to embodiments of the present invention. As shown in FIG. 6, the Q factors for various modulation schemes are plotted as a function the signal-to-noise ratio (SNR). The types of modulation schemes consider in FIG. 6 are binary AM (10 Gb/s), 2-PSK and 2-PPM (10 Gsym/s), 4-PSK and 4-PPM (5 Gsym/s), 8-PSK and 8-PPM (5 Gsym/s), and 16-PSK and 16-PPM (2.5 Gsym/s). The values plotted in FIG. 6 are based on an optical bandwidth of 60 GHz, a data bandwidth of 7.6 GHz, and an optical jitter of 5 ps.” 10:62-11:7 Figs 2, 6, 7 Claims 1, 2
Claim 11	
11. The card as recited in claim 1 wherein the plurality of thresholds indicate an increase in an optical energy level.	WaveMux System discloses this claim limitation explicitly, inherently, or as a matter of common sense, or it would have been obvious to add missing aspects of the limitation. See above re claim 1 which is incorporated by reference herein. See also: See above re claim 1f, 6, 9 which are incorporated by reference herein. One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of WaveMux System and its respective incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ P. R. 3-3 statement,

’327 Patent	WaveMux System
	particularly, § IV.B.5. Rather than repeat those disclosures here, they are incorporated by reference into this chart. Additionally, the following passages and/or figures, as well as all related disclosures, disclose this limitation: *See e.g.* JP H9-46303: For example, see the following passages and/or figures, as well as all related disclosures: “In the comparator 101, a minimum value “VLo” of the control voltage is set. The comparator 101 compares an input voltage V with the minimum value VLo. If V > VLo, the comparator 101 outputs a signal LOW. If V < VLo, the comparator 101 outputs a signal HIGH. In the comparator 102, a maximum value “VHi” of the control voltage is set. The comparator 102 compares an input voltage V with the maximum value VHi. If V < VHi, the comparator 102 outputs a signal LOW. If V > VHi, the comparator 102 outputs a signal HIGH.” [0042-0043] “Fig. 11 illustrates a configuration of terminal equipment to which a third method of the present invention is applied. In addition to the configuration of the above-described first embodiment, an optical receiver 3 of terminal equipment 2 of the present embodiment includes a photodiode (PD) 13 and a peak detection circuit 15. The photodiode (PD) 13 is disposed in parallel to the photodiode (PD) 5. To these photodiodes (PD) 5 and 11, a received signal is inputted. An output of the photodiode (PD) 13 is connected to the peak detection circuit 15. In the peak detection circuit 15, a minimum value and a maximum value are set. The peak detection circuit 15 detects a peak value of an electric signal received from the photodiode (PD) 13, and identifies whether or not the peak value is equal to or higher than the minimum value and is equal to or lower than the maximum value. If the peak value is lower than the minimum value or higher than the maximum value, the optical receiver 3 determines that no optical signal is inputted due to a trouble of the optical transmission path 11 and/or the like. Namely, if a trouble occurs on the optical transmission path 11 and there is no optical amplifier relay station 12 between the trouble occurrence point and the terminal equipment 2, no optical signal will be inputted to the terminal equipment 2. In such a case, a value of a signal outputted from the photodiode (PD) 13 is significantly higher than a value observed when an optical signal is inputted. Thus, the optical receiver 3 can determine that input of an optical signal has been interrupted due to a trouble of

’327 Patent	WaveMux System
	the optical transmission path and/or the like, if the peak detection circuit 13 detects a peak value higher than the maximum value or a peak value lower than the minimum value.” [0060-0061] “Fig. 12 illustrates a configuration of terminal equipment to which a fourth method of the present invention is applied. In addition to the configuration of the above-described second embodiment, an optical receiver 3 of terminal equipment 2 of the present embodiment includes a photodiode (PD) 13 and a peak detection circuit 15. The photodiode (PD) 13 is disposed in parallel to the photodiode (PD) 5. To these photodiodes (PD) 5 and 11, a received signal is inputted. An output of the photodiode (PD) 13 is connected to the peak detection circuit 15. In the peak detection circuit 15, a minimum value and a maximum value are set. The peak detection circuit 15 detects a peak value of an electric signal received from the photodiode (PD) 13, and identifies whether the peak value is equal to or higher than the minimum value and is equal to or lower than the maximum value. If the peak value is lower than the minimum value or higher than the maximum value, the optical receiver 3 determines that no optical signal is inputted due to a trouble of the optical transmission path 11 and/or the like. Namely, if a trouble occurs on the optical transmission path 11 and there is no optical amplifier relay station 12 between the trouble occurrence point and the terminal equipment 2, no optical signal will be inputted to the terminal equipment 2. In such a case, a value of a signal outputted from the photodiode (PD) 13 is significantly higher (or lower) than a value observed when an optical signal is inputted. Thus, the optical receiver 3 can determine that input of an optical signal has been interrupted due to a trouble of the optical transmission path and/or the like, if the peak detection circuit 13 detects a peak value higher than the maximum value or a peak value lower than the minimum value.” [0063-0064]
Claim 12	
12. The card as recited in claim 1 wherein the energy level detector measures optical power.	WaveMux System discloses this claim limitation explicitly, inherently, or as a matter of common sense, or it would have been obvious to add missing aspects of the limitation. See above re claim 1 which is incorporated by reference herein. See also:

’327 Patent	WaveMux System
	See above re claim 1f, 6, 9 which are incorporated by reference herein. One of ordinary skill would find this limitation disclosed either expressly or inherently in the teachings of WaveMux System and its respective incorporated disclosures taken as a whole, or in combination with the state of the art at the time of the alleged invention, as evidenced, for example, by substantial other references identified in Defendants’ P. R. 3-3 statement, particularly, § IV.B.5. Rather than repeat those disclosures here, they are incorporated by reference into this chart. Additionally, the following passages and/or figures, as well as all related disclosures, disclose this limitation: *See, e.g.*, Gao at Page 1551 “Gain flatness of 1 dB and output power up to 21 dBm have been achieved. ... For 980 nm pumped EDFAs, the theoretical minimum intrinsic noise figure (NF) is 3 dB in the electrical domain. For practical amplifiers, NF 4-5 dB is common.”
Claim 14	
[14pre] 14. A transceiver card for a telecommunications box for transmitting data over a first optical fiber and receiving data over a second optical fiber, the card comprising:	*See* claim 1pre.
[14a] a transmitter for transmitting data over the first optical fiber, the transmitter having a laser, a modulator and a controller receiving input data and controlling the modulator as a function of the input data, the transmitter transmitting optical	*See* claim 1a.

’327 Patent	WaveMux System
signals for telecommunication as a function of the input data;	
[14b] a fiber output optically connected to the laser for connecting the first optical fiber to the card;	*See* claim 1b.
[14c] a fiber input for connecting the second optical fiber to the card;	*See* claim 1c.
[14d] a receiver optically connected to the fiber input for receiving data from the second optical fiber; and	*See* claim 1d.
[14e] an energy level detector optically connected between the receiver and the fiber input input to measure an energy level of the optical signals, the energy level detector including a threshold indicating a drop in amplitude of a phase-modulated signal.	*See* claim 1e and 10.
Claim 16	
16. The card as recited in claim 14 wherein the modulator is a phase modulator.	*See* claim 3.
Claim 17	
17. The card as recited in claim 14 wherein the receiver receives phase-modulated signals.	*See* claim 4.
Claim 18	

’327 Patent	WaveMux System
18. The card as recited in claim 14 wherein the energy level detector includes a photodiode and a liner or logarithmic amplifier scaling an output of the photodiode.	*See* claim 5.
Claim 19	
19. The card as recited in claim 14 wherein the threshold is programmable.	*See* claim 6.
Claim 20	
20. The card as recited in claim 14 wherein the energy level detector includes a detector controller capable of setting a value for the threshold.	*See* claim 7.
Claim 21	
21. The card as recited in claim 20 wherein the detector controller receives an indication of the threshold being crossed.	*See* claim 8.
Claim 22	
22. The card as recited in claim 14 wherein the plurality of thresholds bound an acceptable energy range for the received light.	*See* claim 9.
Claim 23	
23. The card as recited in claim 14 wherein the energy level detector measures optical power.	*See* claim 12.
Claim 25	

’327 Patent	WaveMux System
[25pre] 25. A transceiver card for a telecommunications box for transmitting data over a first optical fiber and receiving data over a second optical fiber, the card comprising:	*See* claim 1pre.
[25a] a transmitter for transmitting data over the first optical fiber, the transmitter having a laser, a modulator and a controller receiving input data and controlling the modulator as a function of the input data, the transmitter transmitting optical signals for telecommunication as a function of the input data;	*See* claim 1a.
[25b] a fiber output optically connected to the laser for connecting the first optical fiber to the card;	*See* claim 1b.
[25c] a fiber input for connecting the second optical fiber to the card;	*See* claim 1c.
[25d] a receiver optically connected to the fiber input for receiving data from the second optical fiber; and	*See* claim 1d.
[25e] an energy level detector to measure an energy level of the optical signals, the energy level detector including a threshold	*See* claim 1e and 10.

’327 Patent	WaveMux System
indicating a drop in amplitude of a phase-modulated signal.	
Claim 27	
27. The card as recited in claim 25 wherein the modulator is a phase modulator.	*See* claim 3.
Claim 28	
28. The card as recited in claim 25 wherein the receiver receives phase-modulated signals.	*See* claim 4.
Claim 29	
29. The card as recited in claim 25 wherein the energy level detector includes a photodiode and a liner or logarithmic amplifier scaling an output of the photodiode.	*See* claim 5.
Claim 30	
30. The card as recited in claim 25 wherein the threshold is programmable.	*See* claim 6.
Claim 31	
31. The card as recited in claim 25 wherein the energy level detector includes a detector controller capable of setting a value for the threshold.	*See* claim 7.
Claim 32	
32. The card as recited in claim 25 wherein the detector controller receives an indication of the threshold being crossed.	*See* claim 8.

’327 Patent	WaveMux System
Claim 33	
33. The card as recited in claim 25 wherein the plurality of thresholds bound an acceptable energy range for the received light.	*See* claim 9.
Claim 34	
34. The card as recited in claim 25 wherein the energy level detector measures optical power.	*See* claim 12.
Claim 36	
[36pre] 36. A transceiver card for a telecommunications box for transmitting data over a first optical fiber and receiving data over a second optical fiber, the card comprising:	*See* claim 1pre.
[36a] a transmitter for transmitting data over the first optical fiber, the transmitter having a laser, a modulator and a controller receiving input data and controlling the modulator as a function of the input data, the transmitter transmitting optical signals for telecommunication as a function of the input data;	*See* claim 1a.
[36b] a fiber output optically connected to the laser for connecting the first optical fiber to the card;	*See* claim 1b.

’327 Patent	WaveMux System
[36c] a fiber input for connecting the second optical fiber to the card;	*See* claim 1c.
[36d] a receiver optically connected to the fiber input for receiving data from the second optical fiber;	*See* claim 1d.
[36e] a splitter to split at least a portion of the optical signals to form a split optical signal,	*See* claim 1e.
[36f] a photodetector to measure the split optical signal, the photodetector outputting an electric voltage to correlating to an optical power of the split optical signal, and	*See* claim 1e.
[36g] a detector controller connected electrically to the photodetector.	*See* claim 1e.
Claim 37	
37. The card as recited in claim 36 wherein the modulator is a phase modulator.	*See* claim 3.
Claim 38	
38. The card as recited in claim 36 further comprising a photodiode and a liner or logarithmic amplifier scaling an output of the photodiode.	*See* claim 5.